

# MAMMALS COLLECTED BY DR. W. L. ABBOTT ON BORNEO AND SOME OF THE SMALL ADJACENT ISLANDS.

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## INTRODUCTION.

Before collecting on the mainland of Borneo, Dr. W. L. Abbott made two expeditions to adjacent islands, the mammalian fauna of which is closely allied to that of Borneo. One of these expeditions was to the Natuna Islands, north of Borneo, and was made during the spring and summer of 1900; the other was to the Karimata Islands, off the west coast, during August and September, 1904. Lists of the mammals obtained on these expeditions were published by Mr. Gerrit S. Miller, jr., in 1901 and in 1906.<sup>1</sup> More recently Doctor Abbott has visited the mainland of Borneo five times, on each occasion stopping at some of the adjacent islands. An account of the mammals collected on the first trip to the mainland, covering the Kapuas River region, was published by me in 1907.<sup>2</sup> The present paper aims to give an account of the mammals obtained on the remaining four expeditions—two to southwestern Borneo and two to southeastern Borneo—as well as those collected in the near-by islands. For the sake of completeness, I have included in the present paper the species collected in the Kapuas River region, as well as those from Karimata Islands, the latter having been visited a second time. Four short papers<sup>3</sup> have appeared recently which

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<sup>1</sup> Proc. Wash. Acad. Sci., vol. 3, pp. 111-138, March 26, 1901. Proc. U. S. Nat. Mus., vol. 31, pp. 55-66, July 23, 1906.

<sup>2</sup> Proc. U. S. Nat. Mus., vol. 33, pp. 547-572, December 24, 1907.

<sup>3</sup> Lyon, Description of a new squirrel of the *Sciurus prevostii* group from Pulo Temaju, west coast of Borneo. Smiths. Misc. Coll., vol. 48, pp. 275-276, February 4, 1907.

Lyon, Remarks on the Insectivores of the genus *Gymnura*. Proc. U. S. Nat. Mus., vol. 36, p. 449, May 27, 1909. Doctor Abbott's Bornean specimens listed.

Elliot, On the genus *Presbytis* Esch., and Le Tarsier Buffon, with descriptions of two new species of *Tarsius*. Bull. Amer. Mus. Nat. Hist., No. 28, pp. 151-154, May 27, 1910. Describes the tarsier from the Kapuas River region.

Elliot, Descriptions of some new species of monkeys of the genera *Pithecus* and *Pygathrix* collected by Dr. W. L. Abbott and presented to the United States National Museum. Proc. U. S. Nat. Mus., vol. 38, pp. 313-352, August 6, 1910. Describes the common macaques from Karimata, the Kapuas River region, Bawean Island, and Pulo Mata Siri.

deal in part with the mammals included in the present paper, but the collections as a whole are here published for the first time.

A list of the localities visited by Doctor Abbott is given below, together with his geographical and natural history field-notes. Many of these localities are not to be found on the ordinary maps, and reference should be made to the maps on pages 55 and 57.

LIST OF LOCALITIES, WITH GEOGRAPHICAL AND NATURAL HISTORY  
FIELD-NOTES BY DR. W. L. ABBOTT.

WEST BORNEAN MAINLAND, June 6–September 16, 1907.

*Sukadana (or Sukudana).*—At Sukudana a mass of hills 1,000 to 2,000 feet high rise right from the seashore. They are well forested, but there are many plantations of durians and other fruit upon their slopes and many clearings in the neighborhood. The sea is very shallow near the coast; otherwise it would have been a good collecting ground for me,<sup>1</sup> as animal life is abundant in the neighborhood. The inhabitants are all Malays except a few Chinese traders and small planters.

*Sempang River.*—The country along the Sempang River is low and swampy, very little above high water, as is also nearly all west Borneo near the coast. The lower part of the principal affluent, the Semandang, is also low and flat. The headwaters of both rivers are among the hills. The low country is for the most part heavy forest, with a strip of clearing along the river banks. The hilly country is inhabited by Dyaks and here there is comparatively little virgin forest remaining. The greater part of the surface is covered with secondary jungle. A few rhinoceroses are said to inhabit the upper Sempang about Batu Dayeu (or Dajeuh). A much larger cat than *Felis nebulosa* occurs, called by Malays and Dyaks “rimow.” It must be very rare, as very few people whom I met had ever seen it. The big red pig (*Sus gargantua*?) I heard of from both Dyaks and Malays, especially about the upper Sempang River, but not reported at all common.

*Matan (or Matai) River.*—The Sungei Matan enters the Sempang at the rajah's kampong (village) called Sempang. I camped about 12 miles up (4½ hours) at a place called Matan. Formerly there was a large kampong there but it was abandoned twenty to thirty years since. Most of the neighborhood is large secondary jungle. The hill called Matan was close by. Animal life was very abundant, and orang-utans plentiful. There are no permanent villages now upon the Sungei Matan, except on the slopes of the hill called Sepunchok, about 2½ hours above Sempang, where there are eight families.

*Mount Palung.*—Palung is 1,110 meters in height. I ascended Panti and remained one night; saw no mammals high up. Panti [not shown on map] is one of the hills of Palung. It is somewhere about 3,500 feet. Rhinoceroses are said to inhabit the lowlands about the base of Palung. No tapir or banting (*Bos*) in this part of Borneo.

SOUTHWEST BORNEAN MAINLAND, June 17–September 29, 1908.

*Kendawangan River.*—The country along the lower Kendawangan River, as elsewhere in west Borneo, is mostly swamp, just above high-water mark. Occasional higher patches and tracts occur which always remain dry and are called “pēmátong,” about what we call “islands” in swamps or “hummocks” in Florida. There are no hills close to the lower river except at Mankol. At Lanchut, 30 miles from the mouth, there is quite a large tract of dry land extending back to Mount Kedio, 4 miles from the river. About Kalang Anyer, a Malay kampong of three houses, 70 miles from the mouth, the banks become higher, with but little swamp. A few miles higher up the hilly and rolling country is reached, the Dyak country, where most of the original jungle has been destroyed and now covered with secondary jungle, scrub, and “alang

<sup>1</sup> Doctor Abbott travels about in a schooner, and the anchorage probably was poor.





with them. On the upper Kendawangan among the Dyaks there are about 200 Malays, mostly about Maro. Nearly every man, both Dyak and Malay, has a gun; so game is remarkably scarce. Luckily, powder is difficult to obtain. The Dutch have not interfered with the natives much as yet, and have not taken away their firearms, as they are gradually doing all over their colonies, much to the advantage of the animal life, for Dyaks devour everything they can kill. I myself saw very much less life than on the Sempang, and far less than in southeast Borneo, where the natives were all disarmed several years ago. The Dyaks kill far more with their "bétantik," or spear traps, than by shooting, except in the case of orang-utan. The Dyaks are extremely fond of the meat of these, and it is useless to look for orangs anywhere in the neighborhood of a Dyak settlement. I could hear nothing of *Sus gargantua*, and probably it does not occur in that part of Borneo, nor could I hear anything of the "rimau," or tiger, which was said to inhabit the Sempang district. A few rhinoceroses are said to inhabit the neighborhood of Mount Kedio and a few sapi utan (*Bos sondaicus*) on its west slopes on the headwaters of the little river Tingar. This is the only place on or near the west coast of Borneo where wild cattle occur. The Malays told me they also existed in some places on the upper Pasaguan River—that is the next large river north of the Kendawangan. The country about Mount Kedio is uninhabited, and there is said to be much animal life there. Fifty or sixty years ago the district was inhabited by Dyaks, but these, becoming involved in war with the Malay rajah, left their homes and fled into the interior. All over this corner of Borneo occur slightly elevated sandy tracts covered with small trees (or smaller trees than the surrounding forest); these are locally called "padang," which is Malay for meadow. Much of this land and a good deal of the drier forest was burned over six or seven years ago, during a period of excessive drought. No rain fell for four or five months, a most unusual occurrence in any part of Borneo, where ordinarily rain falls every month in the year, and there is no proper dry season. The following animals, in addition to some already mentioned, were well known to the natives, but none was obtained during this trip: *Mydaus*, called bôbot by Malay and kalinsida by Dyaks; *Reithrosciurus*; *Felis nebulosa*, rimau dahan; *Felis marmorata*?, a wild cat with a large tail, was caught by a Malay in a snare, but for some reason was not brought to me; *Paradoxurus philippinensis*; *Gymnura*, local name ângkis.

*Batu Jurong*.—Batu Jurong is the southerly point of a range of hills which stretch north-northeast to Mankol on the Kendawangan River. I anchored in a small strait between Pulo Iras and the mainland. Two or three Malay families lived here and had their clearings. Pigs were plentiful; kijang (muntjacs) and rusa were also common, but the Malays were continually after them with their dogs. South of this there are no inhabitants in the southwest corner of Borneo, and until recently none on the south coast west of the Sungei Jelai. Lately, however, about a dozen families of Malays have made clearings on the lower course of the Sungei Ayer Hitam Besar. Animals were said to be plentiful, especially rusa, about Tanjong Kepala, where there is said to be large tracts of short grass. I saw two orangs and the sarongs (nests) of many more about 2 miles east of Batu Jurong, where I shot one female.

*Mankol*.—Mankol lies along the Kendawangan River for about 2 miles. There are about 25 or more houses altogether. At this point the north end of the range of hills (400 to 800 feet high) approaches the river. Animals were scarce, as most of the people had guns, and the jungle in the hills and along the base was full of old jerats and pagars (traps and snares). A few orangs were said to occur, but I saw no traces.

*Lanchut*.—Lanchut is now without inhabitants. It was formerly the most important village on the river and the residence of the rajah. The ground along the river is quite high and dry and covered with secondary jungle and long grass for some distance back from the river. Four or five miles due east rises Mount Kedio, in an uninhabited district covered with heavy forest.



ancient island, joined to the mainland by the elevation of the land and also by silting up a wide tract of mangrove swamp lying in the intervening space. As one ascends the river, a few miles from the bay, evidences of elevation become everywhere visible in the masses of limestone coral projecting from the swampy surface. In many cases the flat surface of the ancient reef is but a few inches below the mud or actually on the surface. A little farther an irregular line of limestone hills, mostly with precipitous and waterworn sides, runs in a general direction parallel with the coast. The uncleared land is all heavy forest. Many old clearings and some new exist in the neighborhood of the rivers. The population of the coast is made up of Bugis, Banjer, and other Mohammedan Malay tribes. Inland is a large Dyak (pagan) population. The Dutch annexed this district in 1905.

*Pangkallahan (or Bangkallaan) River.*—Kampong Pangkallahan is about 7 miles up the river of the same name and is the residence of the *mankoh*, or head of the Dyaks of the district. The country is covered with splendid forest, with only a few clearings. There are ranges and scattered hills of precipitous limestone rock. Animals seemed scarce, as usual in Dyak districts, everything hunted off or driven away by the Dyaks and their dogs. They have very few guns and no powder. About a half mile above the village is the lower entrance to the Temmelung or tunnel of the Pangkallahan. This tunnel cave, through which the river flows, swarms with bats as well as with edible birds'-nest swifts, hundreds of thousands of their nests being collected annually. I could not devise any way of catching the bats, as I had no net and had not brought a gun for fear of a capsized, there being a dangerous rapid near the lower end of the tunnel. The Temmelung must be about 2 miles long, judging by the time we took passing through it. It is through limestone rock. I do not think the roof was anywhere very thick, at some places only 2 or 3 yards. That part of the country is full of limestone hills and rocks all honeycombed with caves and passages. But bats did not seem to be present in the hundreds of holes I visited, except an occasional individual which I could not secure. Judging from the noise, for the light from the torches did little but accentuate the gloom, there must be hundreds of thousands in the Temmelung. Another tunnel occurs farther up the same river, but I did not visit it, as it was said to be very difficult of passage except by a very small canoe.

*Saratok River.*—The Saratok is a small river flowing into Klumpang Bay. Two Dyak houses stood in a small new clearing. Back of this and extending eastward for nearly 2 miles was a large tract of *alang alang* (tall, coarse grass) covering several hundred acres. There appeared to be a good many *rusa* here, but the grass, 4 to 5 feet high, made it very difficult to shoot anything. When the grass is burned off in the dry season the place is said to be frequented by a herd of *sapi utan* (*Bos sondaicus*). There were no tracks of these at the time of my visit. Most of my collecting was done near some limestone hills and rocks about a mile westward in the midst of splendid forest. Only the red *Presbytis* was seen here; near the coast only the black one existed.

Besides the animals shot in Klumpang Bay I saw the long-tailed and the pig-tailed macaques and *Presbytis cristata*.

PAMUKANG OR TJENGAL BAY, March 17–April 7, 1908, and March 23–April 13, 1909.

Musangs were generally scarce except the *tangalunga*, which was common. I let most of those go which I caught in traps. The *Mydaus* was well known, but no specimens were obtained. *Gymnura* must be very common, as one often smelt them in the jungle, although none were obtained. The pig-tailed macaque was twice met with in droves, but none were secured. I met with *Reithrosciurus* twice on Bukit Batu. It was running on the ground in heavy forest. Its movements were so quick I could not shoot it. Its big bushy tail, carried high over its back, made the animal very conspicuous. I was much surprised to find that it is a ground squirrel. The headman of the Bajaus at Sungei Manungul, Pamukang Bay, said there used to be some rhinos in that locality, but he had seen no traces for years.

PASIR RIVER, December 31, 1908–January 22, 1909.



BALIK PAPAN BAY, February 1–February 24, 1909. Balikpapan Bay extends nearly 18 miles in a northerly direction. Several rivers empty into it. The eastern shore is high and hilly for the most part, the western low and covered with mangroves. There were very few inhabitants when the Royal Dutch Oil Company first established its headquarters here about fifteen years ago. Now there is a large settlement, wharves, oil refineries, paraffin works, etc., and about 6,000 inhabitants, situated on the eastern entrance to the bay. It is an excellent harbor. The shores of the bay are still mostly heavy forest. The line of the bay probably coincides with that of a fault. The hills are mostly red laterite, but a line of limestone stretches southwestward not far from the head of the bay. Animal life is fairly plentiful. Banting (*Bos sondaicus*) were said to occur especially around the head of the bay.

PULO LAMUKOTAN, May 7–10, 1907. Pulo Lamukotan is the largest of the Burong Islands, and lies about 10 miles off the mainland of Borneo. It is about 4 miles long by 1 mile wide. It consists of a long ridge with a low rock near the middle of the island. The highest point is near the southern end and is nearly 1,000 feet in height. Most of the surface is now cleared and the lower parts entirely planted with coconuts, which are very fine and healthy. The only heavy forest remaining covers the highest summit and the crest of the ridge on the southern part of the island, and a smaller piece on the summit of the northern ridge. The soil seems fertile and the surface is not very rocky, except upon the shore. The forest trees are very large in the remaining jungle. The other islands in the group, four in number, are smaller and have been entirely cleared and planted with coconuts. The inhabitants are Malays from Sambas. A *Sciurus vittatus*, a *Macacus cynomolgus*, a large pig, and three or more rats constitute the mammalian fauna. Pigs are not now very numerous, having been largely hunted off by Chinese from the mainland, who employ dogs. Pigs were formerly very abundant upon the other islands of the group (Penata and Kebun), but have been entirely exterminated upon these since the clearing of the jungle. Rats seemed pretty common. My traps were set in the jungle on the ridge near the highest peak. Fruit pigeons and Nicobar pigeons were fairly common.

PULO TEMAJU, May 5–6, 1907. (First visited by Doctor Abbott in 1905.) Pulo Temaju is now mostly cleared and planted with coconut. The only heavy forest remaining covers the summit and upper slopes of the highest peak. There are no mammals except *Sciurus proserpinæ* and rats. The coconut trees are not very productive and seem much diseased.

PULO DATU, May 2–4, 1907. Pulo Datu lies 21 miles from the coast of Borneo. It is about 1½ miles long by three-fourths mile wide. It is very hilly (mountainous) and rocky, and rises to about 1,000 feet. It is covered with heavy forest, except at some places on the east side, where some clearings have been made and a few coconuts planted. The clearings are now overgrown with large secondary jungle, as the rats swarm to such an extent it is impossible to grow anything. Squirrels (*Sciurus vittatus* group) are plentiful. No monkeys. I put out about forty rat traps one night. Nearly every one was sprung in the morning, but many of the rats had been devoured by land or hermit crabs. White fruit pigeons and Nicobar pigeons were common. There are no sand beaches, but plenty of fresh water flows out beneath the rocks, on the east side at any rate, between high and low water marks. *Mus "rattus"* appeared to be more abundant than *M. "lingensis,"* but the hermit crabs showed marked preference for the latter and spoiled most of those caught.

PULO PANEBANGAN, May 16–26, June 2–3, and September 20–21, 1907. Pulo Panebangan lies 8 miles from Pulo Maja, which is practically the mainland of Borneo. It is about 4 miles long by 2 to 3 wide, containing about 6,000 to 7,000 acres. It is very hilly, scarcely any level ground. The highest point is said to be 1,700 feet. It is uninhabited and covered with dense jungle. Rattans (of an almost valueless variety) abound, and the jungle is so matted up with rattans and their flagella as to be impenetrable. In some places the jungle seems to have been cleared at some

previous period, as at the head of the small bay on the north side. *Macacus cynomolgus* was the only monkey seen. There is no lotong (*Presbytis*). The ratufa is probably fairly common, as I frequently heard it. I only actually saw the three which were shot. I thought I saw and heard *Nannosciurus* on one occasion, but am not certain. There is no napu or large tragulus. No deer occurs; no otter tracks seen; and the tangalunga trapped was the only musang seen. The small *Hipposideros* was very common, flying about in the daytime; the larger one was less common. There were several other species of bats flying about in the forest in daylight, but I failed to secure any. No *Rhinolophus* were seen. Another musang is said to occur and also a red flying squirrel. Pigs were plentiful. All those noticed upon the beach seemed to be males. We did not once see a small one out of two or three dozen individuals. Possibly the old males appropriate the beaches and reefs, which are the best feeding grounds, and drive away intruders. The pigs were all very lean and gaunt. Up to the present there are no inhabitants, although there are many durians, mangos, and chempadak. We heard that some Karimata people propose to come in July, 1907, and form plantations.

PULO PELAPIS, May 29-June 1, 1907. Pelapis, a group of four islands, lies  $3\frac{1}{2}$  miles southwest of Panebangan and 17 miles from Karimata. The islands are all hilly and rocky and covered with forest. The highest point is about 1,200 feet. The total area is about 5,000 acres. South Island (also called Pelapis Tengah) is the largest and is nearly  $2\frac{3}{4}$  miles long. All collecting was done upon this island. Some years ago some Malays and Karimata people settled upon South Island and farmed some plantations of coconuts, etc., but three years ago an epidemic broke out, many died and the rest of the settlers fled, and to-day scarce a trace of human occupancy can be seen. Besides the animals obtained, the flying lemur and the common long-tailed macaque occur. No tragulus, no musangs, or no ratufas occur. The pigs come out upon the sand beaches and reefs at low tide, and can be shot without much difficulty. Bats were flying about in the forest on Pelapis, but not nearly so many as upon Panebangan. None were obtained.

KARIMATA ISLANDS, Telok Edar, Karimata Island, October 4-7, 1908. (First visited by Dr. W. L. Abbott in 1905.)

PULO JUANTA, September 10-11, 1907. Pulo Juanta is a small island,  $6\frac{1}{2}$  miles from the mainland, about 1 kilometer long by  $\frac{1}{2}$  wide. It is about 300 feet high. The greater part is covered with heavy forest, but a clearing was made about four years ago and an attempt made to plant coconuts, but nothing could be grown owing to the rats and pigs. About thirty pigs were killed, but many remained. There are still a few on the island, but I could neither shoot nor trap them. There are no squirrels on the island.

PULO BAUWAL, June 12-16, 1908. Pulo Bauwal (or Rendezvous Island) lies near the southwest corner of Borneo. It is about 15 miles from Tanjong Sambar, which is the extreme southwest point. Bauwal is about 6 geographic miles long by 5 in extreme width and contains about 12,000 acres. The strait separating it from the mainland is from 4 to 6 miles wide and 4 to 12 fathoms deep. The island is surrounded by wide coral reefs and hard rocks. The island is composed of hard red rock (iron ore?) and is rather low. There are two or three hills, rising to about 300 feet to the tops of the trees. The surface is rolling and covered with forest. There is some mangrove swamp. A house, inhabited by Pontianak Malays, is on the east coast, and five houses inhabited by Orang Laut from Karimata were established near the northwest corner about three years ago. The fauna is rather peculiar in that there are no squirrels, traguli, rusa, or pigs. Muntjacs and tangalungas are common.

SOLOMBO (not shown on map), December 4-6, 1907. The island of Solombo, or Masolombo Besar, is about 4 miles long by about 2 wide. The surface is mostly rather low and rolling, and there is one hill about 250 feet high. The rock seems to be nearly all volcanic, except, of course, the coral around the shore. The island is surrounded

by a coral reef. It lies midway between Madura and Borneo, 84 miles to each. There is quite a large population, 300 to 400 of Bugis and Madurese. The island has been settled about forty years. Most of the heavy forest has been cleared, except about the hill. The soil, dark red, with many stones and rocks of lava upon the surface, is very fertile, and produces large crops of paddy and maize. The only mammals I saw were flying foxes, which were quite common. Rats were said to be plentiful. There are no monkeys or squirrels. There are said to be many sapi or feral cattle (*Bos sondaicus*), and the natives were very anxious for me to go and shoot some, but I did not have time to do so. They are said to have been running wild a long time. Birds are very plentiful. The anxiety as to the safety of my schooner prevented me from doing as much as I would have liked, besides cutting short my stay, for the wind went around to the northwest and we had to get out on short notice. I should like to have put in several more days and visited Pulo Solombo Kitchil. There are no people upon the latter and it is still uncleared forest. Birds are said to be very plentiful there.

BAWEAN ISLAND, November 24-27, 1907. (Not shown on map.) Bawean Island lies about 60 miles north of the Straits of Madura. It is about 11 miles long by 10 wide, the area being about 100 square miles. The surface is mountainous, several of the hills rising from 2,000 to 2,200 feet. The island is volcanic, the rocks being mostly lava and basalt, with some limestone. There are extensive coral reefs around the coast. Many volcanic cones are scattered about and there are several hot springs. A beautiful lake of about 15 acres called the Telaga occupies the extinct crater of the mountain of the same name. The island is densely inhabited around the coasts, the population being about 50,000. Most of the men go to Java, the Straits, and Sumatra in search of work. Nearly all the saises in Singapore and Penang are Beyanese. One sees but few males between the ages of 18 and 40 in Bawean. The women weave the mats of pandanus, for which the island is famous, and which are exported all over the archipelago. Animal life is not plentiful. Remarkably few birds are to be seen. As for mammals, pigs are very common. The only ones obtained, however, were young—too small to be of any use as specimens. The rusa (*Cervus kuhli*) is not numerous, and is only found in a few localities. The only specimens obtained were three pairs of horns from the kampong of Tombak on the north side of the island. It is more numerous on the hills behind Tombak than at any other place. There is also a porcupine, possibly two species, a musang, a *Manis*, and what appears to be an otter, but they do not seem to be common, and none were obtained. *Pteropus* was very common, but no other bats were seen. The cattle are the tame variety of *Bos sondaicus*, which has been introduced from Bali. They are not used for milk, but are employed to some extent for draft and plowing. A few buffaloes are also kept. There is but little virgin forest left upon Bawean. The largest piece lies upon the northern slopes of the central mountain mass, especially Gunong Besar and the Telaga. There is also a tract upon the west coast which I did not visit, however, and there are some small patches on the eastern and southern slopes of the mountains. The rest of the island is to a great extent covered with small scrub and giant bamboos. Mangos and jack fruit escaped from cultivation form much of the jungle. The scrub is everywhere traversed by the trails formed by the numerous cattle.

ARENDS (or KERAMIAN) ISLAND, November 24, 1908. (See map, p. 57.)

PULO MATA SIRI, December 7-11, 1907, and November 25-December 1, 1908. Mata Siri is the largest of the Laurot or Laut Kitchil Islands. It is  $7\frac{1}{2}$  miles long by  $1\frac{1}{2}$  broad, is 1,400 feet high. There is scarcely any level ground, the whole island being hilly, consisting of a long ridge dividing into two peninsulas at its northeast end, inclosing the bay of Telok Sungei. It is a good, safe harbor, and we lay there in security, although the westerly monsoon was blowing strong at the time. The other two islands of the group, Kalambau and Kadapangan, are each about one-half the size of Mata Siri, and each consists of one long ridge. The islands are of granite

formation, with but little coral reef around them. Rats of one species were very plentiful; a very pale *Sciurus vittatus* was common, so was the ordinary long-tailed macaque. I shot one *Pteropus* and a pair of *Cynopterus*, also another bat (*Megaderma?*), but it was lost in the jungle. A muntjac (or kijang) is common, but I only had a glimpse of one. As the island is covered with dense unbroken jungle it is almost impossible to shoot them. The animal only occurs on Mata Siri. It is possible it may have been introduced by man. We heard them barking daily, and they must be very numerous. None of the group is permanently inhabited, but Malays visit the islands from Pulo Laut and Pasir to collect turtles' eggs and birds' nests. Evidently there have been some clearings and cultivations in the past, as there is secondary jungle in some places which is now almost indistinguishable from the original forest. My crew saw a dugong in the bay.

PULO LAUT, December 16-29, 1907. Pulo Laut is a large island lying at the southeast corner of Borneo. The strait separating it is about 30 miles long and from 1 to 3 miles wide. The depth is 4 to 10 fathoms. The island is 55 geographic miles long by 20 wide. The north end is very hilly, the highest points being about 2,300 feet. Most of the rest of the surface is comparatively flat, with isolated hills. There is a large population of Bugis and Banjar people. The higher hills are still mostly covered with heavy forest, but much of the lower land has been cleared for paddy and pepper cultivation. This last is the staple production of the island. Some coal is mined in the hills at the north end. Kota Baru, near the northern entrance to the strait, is the seat of the Dutch Kontroleur of the district, and is quite a busy little place. The mammals of Pulo Laut are as follows: *Rusa* and *Sus barbatus*, both common; some very big pig (*Sus gargantua?*) said to occur; there is said to be a large red flying squirrel; napus were common, and a smaller kanchil was said to be less common, but I did not see it; *Bos sondaicus* may be truly wild (not feral) on Pulo Laut, as it is common on the opposite mainland; it is said to be numerous on Pulo Bira Birahan on the south coast of Pulo Laut; it is only one mile long and must have been introduced there. Gibbons, *Nasalis larvatus*, pig-tailed macaques, and *Mydaus* do not occur on Pulo Laut.

PULO SEBUKU, December 31, 1907-January 5, 1908. Pulo Sebuku lies east of Pulo Laut, from which it is separated by a shallow strait only a mile wide in some places. The strait about the middle has only about a foot of water at low tide. Sebuku is  $17\frac{1}{2}$  geographic miles long by about 5 wide. The highest point is only about 400 feet and the whole island is low but not swampy. The surface is mostly rolling. The inhabitants are mostly Bugis and Banjar people. It is thinly inhabited and the surface is still covered with heavy forest. The soil is red. Some black pepper is grown, and billian wood is cut. The Bugis build small praus here. As the strait separating Sebuku from Laut is so shallow, particularly at the northern end, I had to anchor the schooner near the northern end of the island, between the northwest point and the small coconut-covered island of Manti. Here we lay a mile offshore, just afloat at low tide. Rats were very plentiful in the jungle, *Sciurus* "*vittatus*" common; so was the ratufa, which seems much the same as that of Pulo Laut, but is a little smaller. The ordinary long-tailed macaque is the only monkey. A small napu is very common, although I secured but one pair. Pigs and rusa occur, and musangs are said to occur, although I did not meet with them. No tupaia were noticed.



DESCRIPTIONS OF SPECIES, WITH CRITICAL ANNOTATIONS  
AND LISTS OF SPECIMENS.

## MANIS JAVANICA Desmarest.

1907. *Manis javanica*, LYON, Proc. U. S. Nat. Mus., vol. 33, p. 548, December 24, 1907.

Two specimens from Pontianak, collected in 1905.

## BOS SONDAICUS Schlegel and Müller.

1839-1844. *Bos sondaicus* SCHLEGEL AND MÜLLER, Verh. Nat. Gesch. Nederl. Bezitt., p. 197, pls. 35-39.

Two specimens, skins and skulls, from Pamukang Bay—an adult female, Cat. No. 154385, collected in 1909, and a female calf, Cat. No. 151865, collected in 1908. The general body color of the adult lies between Ridgway's hazel and chestnut; a conspicuous narrow black stripe extends down the back from behind the shoulders to base of tail; from the base of the neck to the beginning of the black stripe there is an inconspicuous reddish stripe due to a general brightening of the general body color; the general color effect of the head and neck is something between russet and wood brown; the underparts are almost blackish; the "stockings," buttock patch, inside of ears, and the chin vary from dirty white to cream-buff; the tail is long-haired, the upper two-thirds being of the body color, the terminal third blackish. The calf is similarly colored to the adult, but much duller, so that the general effect is much like russet. The colored illustrations of *Bos sondaicus* by Schlegel and Müller are good representations of the present specimens except that the adult female in the plate is rather dull.

Measurements of the adult female: Head and body, 2,060 mm.; tail, 670; hind foot, 560; height at shoulder, 1,280; at rump, 1,310; weight of cut-up carcass without entrails, 386 pounds (175 kilos); estimated live weight, 500 pounds (227 kilos); basal length of skull, 405 mm.; condylo-basal length, 434; zygomatic width, 175; maxillary toothrow, 128; mandibular tooth row, 135.

This was quite common about Pamukang Bay, and I wasted much time in trying to get a specimen. Twice I was close to herds containing good bulls, but all my heavy rifle cartridges had gone bad. The cartridges had been five years on the *Terrapin* [Doctor Abbott's schooner] and the caps would not explode. To what extent these cattle are indigenous and to what extent, if any, feral, it is impossible to say. They are also found wild upon Pulo Laut, and even it is said on the small island of Bira Birahan, near the south end of Laut. They could not have been indigenous on that little island, only a mile long. At the present day very few cattle are kept by the natives. But the praus from Madura and Bali bring up many Bali cattle for beef every year. These and the wild ones look just alike.—W. L. A.

## TRAGULUS NAPU BORNEANUS (Miller).

1902. *Tragulus borneanus* MILLER, Proc. Biol. Soc. Wash., vol. 15, p. 174, August 6, 1902.  
1907. *Tragulus borneanus*, LYON, Proc. U. S. Nat. Mus., vol. 33, p. 550, December 24, 1907.

Doctor Abbott has collected thirty specimens of *Tragulus* of the *napu* group in Borneo and on the large Pulo Laut. A careful comparison of these with a large number of specimens from various localities in Sumatra, the type-locality of *napu*, shows that the Sumatran and Bornean *napus* are almost identical in point of size, color, and cranial characters. The Bornean animal averages a very little smaller in most external and cranial measurements. (See table of measurements, p. 66.) At the same time the throat markings are slightly darker and the collar slightly wider than they are in typical *napu*. These differences, however, are very slight and not at all constant, and it is only possible to identify with certainty a little over half the specimens in each series. The specimens from Pulo Laut average slightly smaller in their cranial measurements than do those from Borneo proper, but not enough to justify their recognition as a distinct race. Externally there are no differences. Mr. Gerrit S. Miller, jr.,<sup>1</sup> has lately intimated that the Bornean *napu* would prove to be very closely related to if not identical with the Sumatran one. The following localities are represented in Doctor Abbott's series: Kapuas River, 3; Sempang River, 2; Matan River, 4; Kendawangan River, 3; Saratok River, 1; Pamukang Bay, 4; Pulo Laut, 13.

(For measurements of the adults of this series, together with those of the original series of *Tragulus borneanus* and of Sumatran *napus*, see table, p. 66.)

## TRAGULUS SEBUCUS, new species.

*Type*.—Skin and skull of adult male; Cat. No. 151810, U.S.N.M.; collected on Pulo Subuku, off southeastern Borneo, January 4, 1908, by Dr. W. L. Abbott. Original number, 5736.

*Diagnostic characters*.—A small member of the *napu* group, similar in size and color to *Tragulus pretiellus* Miller<sup>2</sup> of Pulo Bakong, Rhio-Linga Archipelago, but blacker above and with posterior pair of dark throat markings almost clear blackish instead of mixed blackish and ochraceous.

*Color*.—Upper parts of body, a mixture of black and ochraceous, the former in excess; sides of body similar, but the ochraceous lightening to ochraceous buff, or buff; under parts of body white, but much suffused in the middle line with pale ochraceous buff, this latter color also forming a fairly well defined line between the color of the sides and

<sup>1</sup> The Mouse Deer of the Rhio-Linga Archipelago: A Study of Specific Differentiation under Uniform Environment. Proc. U. S. Nat. Mus., vol. 37, p. 4, September 1, 1909.

<sup>2</sup> Proc. U. S. Nat. Mus., vol. 31, p. 253, September 11, 1906.

that of the under parts; top and sides of head and neck a rather pale or dull tawny ochraceous mixed with some black. A blackish line extends from inner canthus of eye to nose, and on either side of this the tawny ochraceous is rather clear, over a narrow triangular area on top of head it is considerably mixed with black. The usual black nape stripe is barely indicated. Throat pattern composed of four Vs. The first or most anterior V white and bordering the interramial glandular area, except near the middle of the area where there is a small ochraceous spot; second V ochraceous, lined by a few blackish hairs; third V white; fourth V black, except at the point which is prolonged into an ochraceous, slightly mixed with blackish, line about 25 mm. long and passes through the point of the third V to blend with the point of the second V. The sides of the black V are broad and conspicuous. The collar is a mixture of blackish and ochraceous in nearly equal proportions. A narrow line, 2 to 5 mm. wide, mixed blackish and ochraceous in varying proportions, extends from the collar across the white of the chest and into the ochraceous suffusion of the under parts. Outer side of legs mixed tawny ochraceous and blackish, inner side with a narrow white line, bordered on either side by almost clear ochraceous or tawny ochraceous; tail above like back, beneath and at tip white.

*Skull and teeth.*—Aside from their smaller size for a member of the *napu* group, these show no noteworthy characters.

*Measurements.*—External measurements of the type and of a paratype, a female with the last permanent molars not yet cut; Cat. No. 151809. Head and body, 485, 490 mm.; tail, 70, 75; hind foot, including hoofs, 123, 125; weight, 2.3, 2.7 kilos. Cranial measurements: Greatest length, 102.7, 95.7 mm.; upper length, 94, 88.2; condylo-basal length, 94.4, 90; greatest length of nasals, 28.6, 27.9; zygomatic breadth, 46.1, 43.5; breadth of braincase above roots of zygomata, 33.8, 32.8; mandible, back of condyle to front of symphysis, 79.7, 74.5; maxillary toothrow, alveoli, 34.6, —<sup>1</sup>; mandibular toothrow, alveoli, 38.8, —<sup>1</sup>.

*Specimens examined.*—Two, both from Pulo Sebuku.

*Remarks.*—Aside from *Tragulus pretiellus*, the only species with which *T. sebus* needs comparison is *T. nigricans* Thomas.<sup>2</sup> The latter, however, is a larger animal, "apparently about the size of *T. napu*," has a more distinct nape stripe, and the throat pattern considerably different. The posterior dark V is black in color to and including the apex of the V, and the apex is not prolonged into a pronounced line different in color from the rest of the V.

<sup>1</sup> Last molars not through alveoli.

<sup>2</sup> Ann. Mag. Nat. Hist., ser. 6, vol. 9, p. 254, March, 1892.

## Measurements of adult napus.

Name.	Locality.	Catalogue No.	Sex.	Head and body. <sup>1</sup>	Tail. <sup>1</sup>	Hind foot, including hoofs. <sup>2</sup>	Weight. <sup>3</sup>	Condylar-basal length of skull.	Zygomatic width.	Maxillary tooththrow (alveoli).
<i>T. napu napu</i> .....	Sumatra, Tapanuli Bay.	114434	Male....	mm. 550	mm. 70	mm. 146	kilos. 4.0	mm. 107.6	mm. 50.4	mm. 36.8
Do.....	Sumatra, Siak region..	144132	..do.....	554	83	152	4.1	103.9	51.6	36.0
Do.....	..do.....	144133	..do.....	590	100	150	4.2	108.5	50.8	34.8
Do.....	..do.....	144136	Female..	550	90	154	4.1	104.4	53.2	38.7
Do.....	..do.....	144139	..do.....	550	100	150	4.2	103.8	51.3	36.4
Do.....	Sumatra, Aru Bay....	143481	Male....	583	92	147	4.0	111.9	52.3	41.7
Do.....	..do.....	143483	..do.....	565	90	146	3.6	107.7	51.2	40.5
<i>T. napu borneanus</i> .	Borneo, Suanalamba River.	<del>143225</del> 34905	..do.....	.....	.....	<sup>5</sup> 146	.....	101.8	49.2	39.6
Do.....	Borneo, Kinabatangan River.	34905	Female..	.....	.....	.....	.....	107.8	50.0	34.3
Do.....	..do.....	<del>12188</del> <del>34903</del>	..do.....	.....	.....	<sup>5</sup> 145	.....	103.8	51.4	37.8
Do.....	Borneo, Sapagaya River.	<del>12213</del> <del>34932</del>	..do.....	.....	.....	<sup>5</sup> 136	.....	103.7	52.4	36.6
Do.....	..do.....	<del>12215</del> <del>34934</del>	..do.....	.....	.....	<sup>5</sup> 130	.....	107.6	46.3	36.0
Do.....	..do.....	<del>12234</del> <del>34936</del>	..do.....	.....	.....	<sup>5</sup> 131	.....	108.5	.....	34.0
Do.....	Borneo, Kapuas River	<del>49772</del>	Male....	.....	.....	.....	.....	103.6	48.3	36.9
Do.....	..do.....	142345	..do.....	.....	.....	.....	.....	96.7	48.6	36.5
Do.....	..do.....	142346	Female..	545	85	140	4.6	100.8	49.6	37.7
Do.....	Borneo, Matan River..	145345	Male....	565	85	157	4.1	105.5	50.9	37.8
Do.....	Borneo, Kendawangan River.	153753	..do.....	525	65	147	3.2	104.9	49.4	35.5
Do.....	..do.....	153743	Female..	560	.....	148	4.5	107.0	52.7	36.8
Do.....	..do.....	153755	..do.....	531	85	143	2.8	101.1	48.6	36.3
Do.....	Borneo, Saratok River	151811	Male....	545	83	147	4.0	108.5	50.5	36.3
Do.....	Borneo, Panukang Bay.	151813	..do.....	550	90	140	3.5	104.0	52.3	38.0
Do.....	..do.....	151814	..do.....	565	70	148	3.7	111.0	51.6	36.9
Do.....	Borneo, Balik Papan Bay.	154344	..do.....	535	100	142	.....	107.0	50.0	37.5
Do.....	..do.....	154346	..do.....	550	70	142	.....	105.0	48.0	37.6
Do.....	..do.....	154345	Female..	572	98	147	.....	105.5	49.0	37.8
Do.....	Pulo Laut.....	151798	Male....	550	90	150	.....	101.3	46.8	39.1
Do.....	..do.....	151800	..do.....	520	80	145	3.2	100.7	46.5	38.5
Do.....	..do.....	151802	..do.....	550	80	148	3.5	103.0	48.0	38.0
Do.....	..do.....	151806	..do.....	525	90	144	3.3	101.0	47.7	38.8
Do.....	..do.....	151808	..do.....	532	80	141	3.6	101.6	49.5	37.3
Do.....	..do.....	151796	Female..	520	80	146	.....	106.4	48.6	37.7
Do.....	..do.....	151801	..do.....	570	83	152	4.2	103.4	49.7	38.7
Do.....	..do.....	151803	..do.....	572	75	149	4.1	105.7	50.0	35.8

<sup>1</sup> Collector's measurements.<sup>2</sup> Measured by writer.<sup>3</sup> Collector's measurements in pounds and quarters computed into kilograms.<sup>4</sup> Type.<sup>5</sup> This measurement can be considered approximate only.

## TRAGULUS KANCHIL LONGIPES Lyon.

1907. *Tragulus hosei*, LYON (not of Bonhote), Proc. U. S. Nat. Mus., vol. 33, p. 549, December 24, 1907.1908. *Tragulus kanchil longipes* LYON, Proc. U. S. Nat. Mus., vol. 34, p. 628, September 14, 1908.

Doctor Abbott has collected a total of twenty-five specimens of *Tragulus* of the *kanchil* group in western and southwestern Borneo and one in southeastern Borneo. The following localities are represented: Kapuas River, 1; Sempang River, 9; Batu Jurong, 1; Kendawangan River, 14, and Balik Papan Bay, 1. It is with much hesitation that I have referred them to *Tragulus kanchil longipes*, the type-locality of which is the lowlands of eastern Sumatra, but I can find no essential



differences, however, between them. The necks of the Bornean specimens are perhaps not so brightly colored as are those of the Sumatran examples. Only one Bornean skin, Cat. No. 153740, from the Kendawangan River, has a distinct yellowish coloration, resembling the *Tragulus fulvicollis*<sup>1</sup> type, instead of several such specimens, as in the case of the Sumatran series. The length of hind foot, including the hoof, is essentially the same in the two series, and it is distinctly longer than it is in the typical Sumatran kanchils from Aru Bay and Tapanuli Bay. (See table of measurements, p. 68.) A careful study of this table shows that the range of variation of the Bornean skulls is slightly greater than that of typical *kanchil* skulls from Sumatra; and that the skulls of males and females in Borneo are of essentially the same size, the males showing, however, more variation. In the Sumatran series, on the contrary, the skulls of females average larger than do those of the males.

The relationship of the present series of kanchils from southwestern Borneo with *Tragulus hosi* (Bonhote)<sup>2</sup> of northern Borneo is not at all clear. The latter species is represented in the National Museum by the type of *T. virgicollis* Miller<sup>3</sup> and two poor skins, badly made up and much discolored by a salt-and-alum pickling fluid, from northern Borneo. The skulls of these three specimens are indistinguishable from skulls of *T. kanchil* or *T. kanchil longipes*. The skins, however, show the nape stripe to be darker, narrower, and better defined than it is in any of the Sumatran or west Bornean specimens. The Mount Dulit specimen has rather long hind feet; the hind feet of the other two from north Borneo appear shorter, but reliable measurements can not be taken from them.

At present, judging by the material at hand, I believe that three forms of small *Tragulus* occur in Sumatra and Borneo: *T. kanchil kanchil*, from northern and western Sumatra; *T. kanchil longipes*, from the swampy lowlands of eastern Sumatra and the swampy lowlands of western and southwestern Borneo; *T. kanchil hosi*, from northern Borneo.

(For measurements see table, p. 68.)

#### TRAGULUS CARIMATÆ Miller.

1906. *Tragulus carimatæ* MILLER, Proc. U. S. Nat. Mus., vol. 31, p. 55, July 23, 1906.

Four specimens of a kanchil taken on Pulo Panebangan may be referred to *Tragulus carimatæ* Miller. The skins average darker and the nape stripe wider and darker than they do in specimens from the mainland of Borneo. Of the four specimens only one is adult. It

<sup>1</sup> Proc. U. S. Nat. Mus., vol. 34, p. 630, September 14, 1908. Type-locality, Pulo Bengkalis, off east coast of Sumatra.

<sup>2</sup> Ann. Mag. Nat. Hist., ser. 7, vol. 11, p. 239, March 1903.

<sup>3</sup> Proc. Biol. Soc. Wash., vol. 16, p. 37, March 19, 1903.

has the long maxillary tooth-row of *T. carinatae*. Sixteen specimens from Karimata in 1904.

Measurements of the adult, Cat. No. 145352, male: Head and body, 475 mm.; tail, 78; hind foot, including hoofs, 125; weight, 2.2 kilos; condylo-basal length of skull, 90.2; zygomatic width, 44.1; maxillary tooth-row, alveoli, 35.

*Measurements of adult kanchils.*

Name.	Locality.	Catalogue No.	Sex.	Head and body. <sup>1</sup>	Tail. <sup>1</sup>	Hind foot, including hoofs. <sup>2</sup>	Weight. <sup>3</sup>	Condylo-basal length of skull.	Zygomatic width.	Maxillary toothrow (alveoli).
				mm.	mm.	mm.	kilos.	mm.	mm.	mm.
<i>T. kanchil</i> .....	Sumatra, Aru Bay.....	143488	Male.....	442	75	123	1.7	86.0	43.0	31.7
Do.....	do.....	143489	do.....	456	70	126	1.5	87.4	43.3	32.0
Do.....	do.....	143492	do.....	445	65	116	1.7	84.0	43.5	30.6
Do.....	do.....	143497	do.....	460	70	122	.....	87.5	43.3	33.0
Do.....	do.....	143493	Female..	470	80	125	1.8	88.6	45.0	33.3
Do.....	do.....	143494	do.....	450	70	120	.....	88.2	.....	30.5
Do.....	do.....	143495	do.....	455	75	114	1.9	90.3	44.7	34.4
Do.....	do.....	143496	do.....	490	85	128	2.2	92.2	45.7	32.9
Do.....	do.....	143498	do.....	457	70	121	.....	89.9	43.2	32.9
Do.....	do.....	143499	do.....	470	80	124	2.2	91.4	42.9	32.2
Do.....	Sumatra, Tapanuli Bay.	114419	Male.....	432	75	117	1.6	84.4	40.6	31.7
Do.....	do.....	114420	do.....	442	95	129	1.6	85.9	41.8	32.7
Do.....	do.....	114427	do.....	430	70	123	1.6	87.0	41.7	33.0
Do.....	do.....	114426	do.....	425	60	121	1.5	85.8	41.6	31.3
Do.....	do.....	114421	Female..	468	80	128	1.8	88.7	42.4	32.2
Do.....	do.....	114422	do.....	457	80	128	1.8	86.6	42.2	33.4
Do.....	do.....	114423	do.....	470	75	121	1.8	84.4	41.4	31.5
Do.....	do.....	114424	do.....	465	70	122	1.8	87.5	42.5	33.8
Do.....	do.....	114425	do.....	.....	.....	.....	.....	87.3	39.9	32.0
<i>T. k. hosi</i> .....	Borneo, Kinabatangan River.	<sup>191191</sup> 31512	Male.....	.....	.....	126	.....	92.4	46.5	31.3
Do.....	Borneo, Saudakan	<sup>191192</sup> 31541	Female..	.....	.....	124	.....	87.7	43.0	33.0
Do.....	Borneo, Mount Dulit.	<sup>5</sup> 83941	Male.....	.....	.....	133	.....	.....	.....	.....
<i>T. k. longipes</i> .....	Borneo, Kapuas River..	142348	do.....	482	.....	135	2.2	88.2	43.6	34.3
Do.....	Borneo, Sempang River.	145354	do.....	475	77	142	1.9	86.4	43.5	32.8
Do.....	do.....	145355	do.....	460	77	141	.....	92.4	43.8	30.4
Do.....	do.....	145357	do.....	432	75	139	1.6	84.1	41.7	30.2
Do.....	do.....	145358	do.....	458	77	144	2.0	91.4	42.1	32.8
Do.....	do.....	145359	do.....	440	60	139	.....	88.0	41.2	30.4
Do.....	do.....	145360	do.....	450	60	133	.....	84.9	43.4	29.9
Do.....	do.....	145361	do.....	485	70	148	.....	93.8	43.9	31.0
Do.....	do.....	145356	Female..	470	75	140	.....	86.3	41.7	30.0
Do.....	do.....	145362	do.....	461	75	137	.....	85.4	40.3	33.8
Do.....	Borneo, Kendawangan River.	153740	Male.....	450	75	131	.....	89.9	42.9	32.2
Do.....	do.....	153742	do.....	445	75	130	.....	87.5	42.0	33.8
Do.....	do.....	153744	do.....	445	65	130	.....	88.3	42.5	31.7
Do.....	do.....	<sup>6</sup> 153748	do.....	450	85	<sup>1</sup> 133	.....	92.2	42.4	32.4
Do.....	do.....	<sup>6</sup> 153752	do.....	455	65	<sup>1</sup> 135	.....	84.2	40.8	29.4
Do.....	do.....	153754	do.....	.....	.....	.....	.....	81.5	40.3	29.9
Do.....	do.....	153739	Female..	465	75	127	.....	88.8	40.6	34.0
Do.....	do.....	153745	do.....	425	65	125	.....	82.5	40.4	30.4
Do.....	do.....	153749	do.....	.....	.....	135	.....	88.4	41.8	32.2
Do.....	do.....	153751	do.....	460	75	128	.....	87.7	43.0	32.6
Do.....	Borneo, Balik Papan Bay.	154350	Male.....	460	85	126	.....	89.0	44.0	32.4

<sup>1</sup> Collector's measurements.

<sup>2</sup> Measured by writer.

<sup>3</sup> Collector's measurements in pounds and quarters computed to kilograms.

<sup>4</sup> Measurements only approximate.

<sup>5</sup> Type of *Tragulus virgicollis*.

<sup>6</sup> Skulls only.

## RUSA BROOKEI (Hose).

1893. *Cervus brookei* HOSE, Ann. Mag. Nat. Hist., ser. 6, vol. 12, p. 206.

1906. *Rusa brookei*, LYON, Proc. U. S. Nat. Mus., vol. 31, p. 585, December 18, 1906.

1907. *Rusa brookei*, LYON, Proc. U. S. Nat. Mus., vol. 33, p. 550, December 24, 1907.

Twenty-three individuals of *Rusa brookei* are represented in Doctor Abbott's recent collections from southwestern and southeastern Borneo, sixteen of them by antlers obtained from natives, and four by skins and skulls, and the remaining three by skulls and scalps. Two specimens were obtained along the Kapuas River in 1905. (For exact localities and the external, cranial, and antler measurements see tables, p. 70.)

It is possible that more than one species is represented by this material. The skulls of the male specimens from southeastern Borneo average somewhat smaller than the skull of a fully adult male from the Sempang River. The skins of those from southeastern Borneo are decidedly different from that obtained in southwestern Borneo, but the difference is probably one of pelage. It is seen most clearly on the lower back. In the Sempang skin the color appears uniformly dark brownish, although the hairs are very light in color at the base; none of the hairs are annulated. In the specimens from southeastern Borneo the color is very bright and "reddish," and a distinct grizzling is conspicuous. The individual hairs are almost whitish at their bases, gradually changing to a dark brownish about the middle portion, followed by a well-marked bright hazel ring and a blackish terminal band. A more or less well-defined blackish-brown stripe extends along the back of the animal. The pelage difference appears to be independent of season. The three specimens showing the grizzling were collected in February, April, and November, respectively; the dark ungrizzled skin was collected in August.

The single specimen from Pulo Laut shows no noteworthy difference from the mainland individuals.

Generally common, especially about Pamukang Bay. Those found on Pulo Laut had much finer horns than those on the mainland. Two heads obtained at Pamukang Bay have extremely poor horns, but they are certainly not immature. Probably the food is better on Laut. There is good pasturage there. The carcasses of deer from both places are about the same size.—W. L. A.

## External and cranial measurements of Bornean sambars.

Locality.	Catalogue No.	Sex.	Age.	Head and body. <sup>1</sup>	Tail. <sup>1</sup>	Hind foot. <sup>1</sup>	Height at shoulders. <sup>1</sup>	Weight. <sup>2</sup>	Condylar-basal length of skull.	Maxillary tooththrow.	Zygomatic width.
Sempang River.....	145369	Male.....	Nearly adult. <sup>3</sup>	mm. 1,720	mm. 320	mm. 570	mm. 980	kilos. ....	mm. 339	mm. 107	mm. 124
Do.....	145370	do.....	Adult.....	.....	.....	.....	.....	.....	mm. 364	mm. 103	mm. 134
Saratok River.....	151859	Female <sup>4</sup>	do.....	1,780	290	540	1,050	<sup>5</sup> 91	338	104	138
Pamukang Bay.....	151860	Male.....	Old.....	.....	.....	.....	.....	.....	333	90	133
Do.....	151861	do.....	Adult, young.	1,600	240	480	1,040	.....	320	103	136
Do.....	154382	Female.....	do.....	1,670	220	510	1,000	<sup>6</sup> 69	320	96	134
Pulo Laut.....	151858	do.....	Adult.....	.....	.....	.....	.....	.....	321	97	136

## RUSA KUHLII (Müller and Schlegel).

1839-44. *Cervus kuhlii* MÜLLER AND SCHLEGEL, Verh. Nat. Gesch. Nederl. Bezitt., p. 223.

Three pairs of antlers of this small deer were brought back by Doctor Abbott, from the island of Bawean, the type-locality. (For measurements see the last three specimens mentioned in the table below.)

## Measurements of antlers of Sambars from Borneo and Pulo Bawean.

Locality.	Catalogue No.	Circumference of antler above burr.	Circumference of antler above brow line.	Length of antler along convexity of curve.	Burr to tip of brow line along convexity.	Tip of apical tine to its angle with main trunk of antler.
		mm. <sup>1</sup>	mm. <sup>1</sup>	mm. <sup>1</sup>	mm. <sup>1</sup>	mm. <sup>1</sup>
Upper Sempang River.....	145369	80 <sup>(8)</sup>	65 <sup>(8)</sup>	231 <sup>(8)</sup>	<sup>(9)</sup> 122 <sup>(8)</sup>	<sup>(9)</sup> 67 <sup>(8)</sup>
Do.....	145370	154 143	109 102	370 406	122 115	67 70
Pulo Bauwal.....	153773	146 147	107 107	412 410	234 236	30 37
Kendawangan River.....	153774	175 178	131 130	409 395	128 122	50 80
Do.....	153775	164 160	118 115	435 442	208 217	75 67
Do.....	153776	136 135	100 95	394 405	215 212	<sup>(10)</sup> 15
Do.....	153777	112 111	93 90	435 423	167 161	51 46
Do.....	153778	172 177	102 105	415 407	200 187	52 50
Do.....	153779	145 146	122 116	416 405	235 239	108 80
Do.....	153780	145 142	160 103	496 467	147 188	43 39
Do.....	153781	171 75	122 <sup>(11)</sup>	450 195	215 <sup>(11)</sup>	<sup>(12)</sup> 70 <sup>(11)</sup>
Mambulah River.....	153782	163 163	108 103	466 440	245 248	70 78
Do.....	153783	220 <sup>(13)</sup>	178 <sup>(13)</sup>	445 <sup>(13)</sup>	218 <sup>(13)</sup>	140 <sup>(13)</sup>
Mankol.....	153784	200 204	167 170	432 435	205 233	72 60
Pulo Laut.....	151856	167 163	148 146	545 562	200 195	108 125
Do.....	151857	157 167	110 110	436 435	240 230	72 76
Pamukang Bay.....	<sup>14</sup> 151860	98 98	82 81	319 341	68 60	78 5
Do.....	151861	101 100	85 81	287 274	105 95	<sup>(15)</sup> 70 <sup>(15)</sup>
Upper Pasir River.....	154413	172 173	139 139	438 435	<sup>(16)</sup> 255	70 65
Saratok River.....	154414	150 149	120 112	472 485	185 172	136 111
Bawean Island.....	151853	95 95	62 64	324 315	118 110	73 80
Do.....	151854	112 115	75 75	372 374	192 165	60 66
Do.....	151855	102 105	70 70	354 358	142 136	90 83

<sup>1</sup> Collector's measurements.<sup>2</sup> Collector's figures in pounds computed to kilograms.<sup>3</sup> Last molars about half way through alveoli.<sup>4</sup> Embryo in uterus.<sup>5</sup> Estimated by collector.<sup>6</sup> Gutted.<sup>7</sup> First figure, left antler; second, right antler.<sup>8</sup> Broken off.<sup>9</sup> Immature, last molars just coming through, brow line alone present.<sup>10</sup> Absent.<sup>11</sup> Spike antler on right side.<sup>12</sup> A two pointed tine.<sup>13</sup> A left dropped antler only.<sup>14</sup> Fully adult as judged by toothwear, but note small size of antlers.<sup>15</sup> Antlers deformed.<sup>16</sup> Broken.



## MUNTIACUS PLEIHARICUS Kohlbrugge.

1896. *Cervulus pleiharicus* KOHLBRUGGE, Natuurk Tijdschr. Nederlandsch-Indië, vol. 55, p. 192, and plate facing p. 260. Type-locality, Pleihari, southeastern Borneo.

In 1906<sup>1</sup> I described as new a muntjac from the island of Banka, comparing it with specimens of *Muntiacus moschatus* from Sumatra, and with three Bornean muntjacs. At that time I assumed that there was only one species of muntjac on Borneo and used Kohlbrugge's name *pleiharicus* for it, thinking that the antlers he figured were slight variations from the normal type and having seen a pair of similar looking antlers from Tenasserim. Two of those Bornean specimens are females and the third is a pair of antlers from the Sakaïam River. With the much more abundant material that has been collected by Doctor Abbott in Borneo, I quite agree with Kohlbrugge that two distinct forms of muntjac occur on Borneo, and now consider that the two female specimens were correctly identified as *M. pleiharicus* in 1906, but that the single pair of antlers do not represent *M. pleiharicus* but belong to a species to be described below and of which the Banka animal is merely a slightly smaller geographic race.

Doctor Abbott secured six specimens of *Muntiacus pleiharicus*, three from southwestern and three from southeastern Borneo; one young female, two immature males, and three adult males. The antlers of the adult males represent a much more extreme type than do those figured by Kohlbrugge. It is not improbable, however, that they are newly-formed antlers, although the bone forming them looks fully mature and as if they had not been recently covered with velvet. The following is a description of *M. pleiharicus* based on Doctor Abbott's specimens:

General color of the animal a light, dull ochraceous, somewhat like ochraceous-buff, darker and brighter along the middle line of the back and neck, where there is a considerable admixture of a brown somewhat like Prout's forming an indistinct dorsal line; ears dull brownish on the outside, whitish on the inside; bases of ears similar to adjacent portions of head; chin, under side of neck, inner side of fore legs, and inguinal region whitish to cream-buff; hind legs and outer side of fore legs similar to the general pale ochraceous head and body color, except for a slight admixture of brownish along the lower legs, most marked on the fore legs; tail whitish, with a narrow dorsal stripe of dark brownish slightly mixed with ochraceous. Compared with the other species of Bornean muntjac, Cat. No. 151863, adult male from Pamukang Bay, *M. pleiharicus* is very different. The general color of the other is a bright reddish-brown,

<sup>1</sup> Proc. U. S. Nat. Mus., vol. 31, p. 582, December 24, 1906.

very similar to Ridgway's ferruginous, with a fine black grizzle, while the legs are dark brownish, in marked contrast to the ochraceous legs of *M. pleiharicus*.

There are three good adult male skulls of *M. pleiharicus*, each of them with little short spike antlers terminating much longer, slender pedicles. Unlike the antlers figured by Kohlbrugge, none of them show burrs. The length of the antlers vary between 22 and 35 mm., decidedly shorter than those figured by Kohlbrugge. The skulls of the other two males are immature, showing long, slender pedicles of soft, spongy bone, with as yet no differentiation of the tip into hard antler substance.

The most striking characters of the skull of *M. pleiharicus* are its smaller size and shorter and much slenderer antler pedicles. In addition to these, it differs in several minor details, such as extensive articulation of the upper extremity of the premaxilla with the nasal instead of just meeting the nasal; superior portion of the lachrymal, above the large pit, much narrower, the anterior supero-external surface of the malar narrower and more pointed; the arch over the posterior nares not smooth and rounded but marked by a more or less well-defined, rounded ridge, part of the basisphenoids; and interparietal about twice as wide as it is long, instead of about three times. The teeth of the two forms of Bornean muntjac do not show any striking differences; they are about the same size in the two species, hence relatively larger in *M. pleiharicus*. (See pl. 1, figs. 2 and 4, and pl. 2, upper figure.)

(For external and cranial measurements, see table below.)

*External and cranial measurements of Bornean muntjacs.*

Name.	Locality.	Catalogue No.	Sex.	Age.	Head and body. <sup>1</sup>	Tail. <sup>1</sup>	Hind foot. <sup>1</sup>	Height of shoulders. <sup>1</sup>	Weight. <sup>2</sup>	Condylar-basal length of skull.	Maxillary toothrow.	Zygomatic width.
<i>M. pleiharicus</i> ..	Kendawangan River.	153769	Female	Young <sup>3</sup> .	mm. 820	mm. 170	mm. 270	mm. 490	kilos. 10	mm. 147	mm. 335	mm. 62
Do.....	do.....	153770	Male.....	do. <sup>4</sup> .....	913	170	272	.....	13	158	147	75
Do.....	do.....	153771	do.....	Old.....	.....	.....	.....	.....	.....	171	46	77
Do.....	Kumpang Bay.	151862	do.....	Adult.....	905	170	275	520	16	178	57	82
Do.....	Pamukang Bay.	151864	do.....	Young <sup>4</sup> .	850	185	270	525	<sup>6</sup> 9	166	147	73
Do.....	do.....	154384	do.....	Adult.....	900	150	272	540	14.5	167	52	78
<i>M. rubidus</i> .....	do.....	<sup>6</sup> 151863	do.....	do.....	1,000	170	290	580	<sup>6</sup> 16.3	186	54	88
Do.....	Pulo Mata Siri	154383	Female	do.....	1,006	150	254	518	25	185	54	88
<i>M. bancanus</i> .....	Banka.....	<sup>6</sup> 124726	do.....	do.....	920	120	235	450	14	177	54	74
Do.....	do.....	124752	do.....	do.....	970	110	250	470	<sup>7</sup> 19	179	55	77

<sup>1</sup> Collector's measurements.

<sup>2</sup> Collector's measurements in pounds and quarters computed to kilograms.

<sup>3</sup> Second and third molars not through alveoli.

<sup>4</sup> Last molars not through alveoli.

<sup>5</sup> Gutted.

<sup>6</sup> Type.

<sup>7</sup> Uterus contained a nearly mature embryo.

## MUNTIACUS RUBIDUS, new species.

1907. *Muntiacus pleiharicus*, LYON, Proc. U. S. Nat. Mus., vol. 33, p. 550, December 24, 1907. (One pair of antlers from the Sakaïam River.)

*Type*.—Skin and skull of adult male, Cat. No. 151863, U.S.N.M., collected at Pamukang Bay, southeastern Borneo, March 20, 1908, by Dr. W. L. Abbott. Original number, 5907.

*Diagnostic characters*.—A medium-sized member of the genus, much larger and darker in color than *Muntiacus pleiharicus* of Borneo, smaller than *M. moschatus* of Sumatra, and closely resembling *M. bancanus*<sup>1</sup> of Banka, but slightly larger and with darker and longer legs.

*Color*.—Type: General color of upper parts of body hazel, richer and darker in the median line and over the hind quarters, everywhere with a fine blackish grizzle, on the shoulders the hazel paling almost to ochraceous; neck a mixture of dull tawny ochraceous and blackish, the two colors about equally mixed on the sides, and the blackish in excess above; face dull brownish; top of head bright hazel; outer surface of ears dull hazel, except blackish margins; inner surface of ears whitish; covering of pedicles hazel, with a conspicuous black line running down them and continued down on the face over the eyes; sides of head similar to sides of neck; chin and upper portion of throat whitish; underside of neck generally clay color with darker grizzling; middle line of chest and upper belly brownish, something like hair brown, lightening laterally to drab, which gradually blends with the grizzle of tawny ochraceous and blackish of the sides of the body; inguinal and axillary regions whitish, the light color extending part way down the inner side of the legs; outer side of forelegs blackish brown, a narrow area on inner side tawny ochraceous, a small indistinct tawny ochraceous spot above each half hoof; hind legs somewhat darker than forelegs, the inner side being lighter only as far as the heel, a very ill-defined tawny spot above each half hoof; tail deep rich hazel above, white on the sides and below.

*Antlers*.—Normal for the genus, those on the type rather smaller than usual, and the left one injured. (See pl. 3, figs. 1 to 7, pl. 1, figs. 1 and 3, and pl. 2, lower figure.)

*Skull and teeth*.—The skull of *Muntiacus rubidus* is at once distinguished from that of *M. pleiharicus* by its much larger size, stouter antler pedicles, and a marked concavity on its dorsal aspect at the posterior end of the nasals. It is, however, very similar to the skull of *M. bancanus*, the main distinguishing characters being larger size and shorter antero-posterior diameter of the interparietal. The teeth in *M. rubidus* have about the same size that they do in *M. bancanus*

<sup>1</sup> Lyon, Proc. U. S. Nat. Mus., vol. 31, p. 582, December 18, 1906.

and hence are relatively smaller. (See pl. 1, figs. 1 and 3, and pl. 2, lower figure.)

*Measurements*.—See table, p. 72.

*Specimens examined*.—Two, the type and an adult female, Cat. No. 154383, from Pulo Mata Siri, and the frontlets and antlers of twenty specimens, one from the Sakaiam River and nineteen from the Kendawangan River.

*Remarks*.—*Muntiacus rubidus* is very distinct from the other Bornean muntjac, and is very readily separable from the larger Sumatran animal. It closely approaches the muntjac of Banka, of which it is scarcely more than a subspecies. This is another illustration of the close relation existing between the animals of Borneo and Banka. I have referred the adult female from Pulo Mata Siri to *M. rubidus*, because the skulls of the two specimens are almost exactly alike. The skin of the Mata Siri specimen, however, is lighter in color, and the legs are not nearly so dark. I can not believe that the muntjac on Mata Siri is indigenous, but think it must have been brought rather recently to the island from the mainland of Borneo.

#### SUS "VITTATUS."

1906. *Sus vittatus*, MILLER, Proc. U. S. Nat. Mus., vol. 30, p. 748, June 13, 1906.

Two pigs of the *Sus vittatus* groups were collected on Bawean Island. Neither of them is fully mature. The older, Cat. No. 151841, has the last molars not quite level with the rest of the tooth-row; the younger, Cat. No. 151840, has the last molars just breaking through the alveoli. The skull measurements of the two specimens are respectively: Upper length of skull, 330, 290; zygomatic width, 132, 120; parietal constriction, 37, 31; maxillary toothrow, 108, —;  $m^2$ , 20 x 16, 20 x 16;  $m^3$ , 31 x 18, —.

#### SUS BARBATUS Müller.

1839. *Sus barbatus* MÜLLER, Tijdschr. Natuurl. Gesch. Physiol., vol. 5, p. 149. (Type-locality, Banjermassing.)

1906. *Sus barbatus*, MILLER, Proc. U. S. Nat. Mus., vol. 30, p. 739, June 13, 1906.

1907. *Sus barbatus*, LYON, Proc. U. S. Nat. Mus., vol. 33, p. 550, December 24, 1907.

In addition to the six skulls of *Sus barbatus* obtained from the natives along the Landak River in 1905, Doctor Abbott has since obtained twenty-nine adult specimens of this pig from Borneo, and adjacent islands. (See tables on pp. 76 and 77 for a list of these specimens, with their external and cranial measurements.) The four adult specimens from Pulos Pelapis and Panebangan average somewhat smaller than specimens from the mainland, and their teeth show relatively more wear in proportion to their age, as judged by skull sutures. I can find no satisfactory structural characters by which they may be distinguished from mainland animals. The



excessive wear of the teeth on these island specimens is probably due to some difference in the character of the food on the island as compared with the Bornean mainland.

One of the females had four fetuses in utero, another seven, one nine, one ten, and another eleven. One female had seven young with her.

Very common about Pamukang Bay. Have never been in a place where pigs were as common as in some localities in this district. For some reason I got only three boars, but the sows with their young simply abounded. Twice while the schooner was anchored at Tanjong Kramet droves of pigs attempted to swim across Klumpang Bay. I was absent up river at the time. My Malay skipper went after them in a small boat and bagged an old boar with a club. On the other occasion thirteen pigs swam close to the vessel, but no boat was available and they passed without molestation. Sometimes they get into kelongs (fish fykes) at low tide. The sows appear to go in gangs of three to five, both when pregnant and when they have their young. It appears to take most of their time to procure sufficient food when suckling, for I met with these gangs roaming about nearly all day. *Sus gargantua* does not appear to occur in this district (Klumpang Bay region). No one had ever seen or heard of it. A small black hairy pig is said to be locally plentiful. The Dyaks call it "By wangi" (literally moon-pig). I saw nothing of it. It was said to be very small, the males, with tusks, the size of goats or less. It is probably some sort of *Sus vittatus*.—W. L. A.



## Dimensions.

Head and body * . . . . .	mm.	Sem pang River, Cat. No. 145293, female, $m^3$ almost unworm.	Pulo Bauwal, Cat. No. 153785, female, $m^3$ moderately worm.	Kendawangan River, Cat. No. 153787, female, $m^3$ unworm.	Kumpang Bay, Cat. No. 151843, female, $m^3$ moderately worm.	Kumpang Bay, Cat. No. 157844, female, $m^3$ slightly worm.	Kumpang Bay, Cat. No. 151845, female, $m^3$ slightly worm.	Tjantung River, Cat. No. 151846, female, $m^3$ much worm.	Kumpang Bay, Cat. No. 151850, female, $m^3$ slightly worm.	Pamukan Bay, Cat. No. 151851, female, $m^3$ moderately worm.	Sampahpahan River, Cat. No. 151852, female, $m^3$ moderately worm.	Pamukan Bay, Cat. No. 15379, female, $m^3$ moderately worm.	Pamukan Bay, Cat. No. 154380, female, $m^3$ moderately worm.	Balik Papan Bay, Cat. No. 154377, female, $m^3$ slightly worm.	Balik Papan Bay, Cat. No. 153778, female, $m^3$ much worm.
Tail * . . . . .	mm.	1,440	1,270	1,300	1,320	1,300	1,300	1,300	1,350	1,375	1,400	1,400	1,350	1,350	1,350
Hind foot * . . . . .	mm.	210	220	215	210	240	240	220	240	240	250	250	290	210	210
Height at shoulder * . . . . .	mm.	285	265	280	270	280	280	290	270	285	280	280	290	273	273
Weight in pounds * . . . . .	lbs.	740	680	630	660	670	670	670	680	680	770	770	750	750	700
Weight in kilograms . . . . .	kilos.	182	168	156	166	166	166	166	166	166	190	190	188	188	170
Upper length of skull . . . . .	mm.	437	424	424	437	437	437	437	437	437	437	437	437	437	437
Basal length . . . . .	mm.	384	360	360	347	340	340	340	340	340	340	340	340	340	340
Basilar length . . . . .	mm.	365	340	340	328	320	320	320	320	320	320	320	320	320	320
Palatal length . . . . .	mm.	304	286	261	272	268	268	272	291	288	289	289	256	268	268
Width of palate at $pm^1$ . . . . .	mm.	48	44	39	51	40	41	41	43	43	43	43	39	43	43
Width of palate, including $m^3$ . . . . .	mm.	73	64	65	71	64	68	68	67	67	72	72	67	68	68
Least width of palate at front of $m^3$ . . . . .	mm.	28	24	25	30	25	27	29	25	28	29	29	24	26	26
Zygomatic breadth . . . . .	mm.	155	139	132	146	138	132	132	149	145	154	154	130	142	139
Least interorbital breadth . . . . .	mm.	69	63	57	68	64	58	58	66	65	65	65	65	65	65
Parietal constriction . . . . .	mm.	20	9	20	21	11	19	19	20	19	10	10	17	11	11
Nasal breadth at posterior extremity of premaxilla . . . . .	mm.	35	29	30	34	27	30	30	37	33	33	33	33	33	33
Length of nasals . . . . .	mm.	220	193	192	200	188	192	210	198	188	212	212	200	211	200
Occipital depth to basion . . . . .	mm.	132	115	102	103	113	114	104	120	113	119	119	112	113	123
Mandible . . . . .	mm.	332	305	290	296	293	301	314	308	314	322	322	302	311	302
Maxillary toothrow . . . . .	mm.	145	122	127	124	128	125	122	126	116	124	124	126	128	125
Second upper molar . . . . .	mm.	25 x 20	23 x 18	23 x 18	23 x 19	25 x 18	24 x 18	24 x 18	25 x 20	22 x 17	22 x 20	25 x 21	25 x 21	22 x 18	24 x 22
Third upper molar . . . . .	mm.	36 x 23	33 x 19	34 x 21	33 x 20	30 x 18	31 x 20	32 x 20	34 x 21	30 x 19	35 x 22	35 x 22	35 x 21	33 x 20	34 x 25
Mandibular toothrow . . . . .	mm.	130	116	121	113	120	122	119	122	115	116	124	121	116	123
Second lower molar . . . . .	mm.	24 x 16	22 x 15	22 x 15	21 x 16	23 x 16	23 x 16	23 x 15	24 x 16	22 x 16	23 x 16	24 x 16	24 x 16	22 x 15	23 x 16
Third lower molar . . . . .	mm.	40 x 20	39 x 16	37 x 17	33 x 17	34 x 16	36 x 18	34 x 18	38 x 17	34 x 17	35 x 19	37 x 19	39 x 18	36 x 17	38 x 18

\* Collector's measurements.

† Guttled.

## IOMYS LEPIDUS, new species.

*Type*.—Skin and skull of adult male, Cat. No. 153684, U.S.N.M., collected at Batu Jurong, southwestern Borneo, June 27, 1908, by Dr. W. L. Abbott. Original number 6005.

*Diagnostic characters*.—Related to *Iomys thomsoni* (Thomas)<sup>1</sup> from which it differs in its smaller size.

*Color*.—Type: General color of upper parts of head and body, of upper surface of parachute, and of outer surface of fore and hind legs dark, hair brown, irregularly and finely lined with the buffy or cream buff subterminal annulations of the hairs, the buffy color darker and the annulations wider about the sides and the shoulders; under surface of parachute and inner side of forelegs bright ochraceous buff, under surface of neck and body, and inner surface of hind legs, and scrotum, pinkish buff, a small spot on chin whitish; upper surface of tail an indefinite brownish color, but much "reddened" by the showing through of the ochraceous to ochraceous-rufous of the hairs of the underside of tail; underside of tail nearly a clear, but rather dull ochraceous-rufous; sides of head and neck, below eye and ear, buffy to ochraceous-buff; inner side of ears with only a few short hairs, not enough to color them, outer side of ears nearly naked on distal half, basal half with hairs colored like those on top of head.

*Measurements*.—External: Type, Cat. No. 153684, from Batu Jurong and paratype, Cat. No. 151792, young adult male, from Klumpang Bay, and those of the type of *Iomys thomsoni*, respectively: Head and body, 190, 189, 231 mm.; tail, 190, 176, 199; hind foot with claws, 38, 40, 40.5. Cranial measurements: Greatest length of skull, 42.7, 42.3, 46.5; basilar length, 32.5, 33.5, 37; greatest breadth, 27.4, —, 29.6; length of nasals, 13, 12.2, 13; upper cheek teeth, 8.7, 9.3, 9.2.

*Specimens examined*.—Two.

*Remarks*.—While *Iomys lepidus* is closely related to *I. thomsoni*, yet its smaller size serves to distinguish it. In color both forms are very much alike as far as can be told without an actual comparison of specimens. *I. lepidus* probably ranges throughout southern Borneo, while *I. thomsoni* is very likely confined to the northern portions of the island.

This squirrel was one of a pair which had a nest of leaves about 11 inches in diameter, in the top of a small sapling, about 20 feet from the ground. They both flew out on the tree being shaken, the male going to a large tree trunk, where he was shot. The other was lost sight of.—W. L. A.

<sup>1</sup> Ann. Mag. Nat. Hist., ser. 7, vol. 5, p. 275, March 1900. Type-locality, Bakong River, Eastern Sarawak, Borneo.



## LARISCUS DIVERSUS (Thomas).

1898. *Funambulus insignis diversus* THOMAS, Ann. Mag. Nat. Hist., ser. 7, vol. 2, p. 248. September, 1898. Type-locality, Baram River, Eastern Sarawak, Borneo.

Seven specimens of *Lariscus* collected in southern Borneo by Doctor Abbott differ in no essential respects from north Bornean specimens as described by Thomas. The latter's remarks about the Bornean form "perhaps averaging slightly larger" than the Sumatran form does not hold good as regards the present specimens and Sumatran examples from Tarussan Bay. The Borneo skulls are distinctly smaller and more slender than are the Tarussan Bay skulls.

(For measurements and exact localities of the seven specimens, see table, p. 92.)

Doctor Abbott has collected four distinct forms of *prevostii* squirrel on the Bornean mainland. They are *Sciurus borneoensis borneoensis* from the higher ground north of the Kapuas River, *S. b. palustris* from the swampy region north of the Kapuas River, *S. sanggaus* from southwestern Borneo, south of the Kapuas River, and *S. atricapillus* from southeastern Borneo. Colored illustrations of all four forms are well shown on plate 4 which was made directly from the skins.

## SCIURUS SANGGAUS Lyon.

1907. *Sciurus sanggaus* LYON, Proc. U. S. Nat. Mus., vol. 33, No. 1577, p. 554, December 24, 1907.

In addition to the original large series of squirrels of this species taken along the south bank of the Kapuas River in 1905, Doctor Abbott has secured twenty-seven others from the coast region of southwestern Borneo. (For exact localities, see table of measurements, p. 83.) Although the large series of specimens of this squirrel taken as a whole are fairly uniform in coloration, yet there is a tendency toward differentiation shown by specimens from certain localities in the range of the species. Skins from Sukadana agree in every respect with those from Sanggau. One from the mouth of the Sempang River, Cat. no. 145441, and two others from the Semendang River have darker and "redder" shoulders than usual, in this respect being very much like the two specimens from Pulo Kubu in the original series of *S. sanggaus*, but not quite so dark. Nearly all the squirrels from along the Kapuas River below Sanggau have the underparts darker in color than the Sanggau and the Sukadana skins. Specimens from the Kendawangan River region have the underparts a lighter "red" and the shoulder area and sides of head and neck lighter in color and the white of the thighs less grizzled with black than have the Sanggau or Sukadana specimens. The different members of this species may be roughly placed in three groups:

1. The Sanggau-Sukadana specimens, typical of the species.
2. The

specimens from the lower Kapuas, and some from the Sempang and Semendang rivers, with darker underparts and "reddish" shoulders. 3. The Kendawangan River specimens with lighter underparts and shoulders, and a clearer white on the thighs. In any of the three groups a few intergrading specimens may be found. As none of the three forms has a definite range, so far as known, it does not seem advisable to recognize them by name. The characters of the Kendawangan River series, however, are nearly as distinctive as are those of some of the insular forms of the *prevostii* group of squirrels.

(For measurements, see table, p. 83.)

See figure next to the bottom one on plate 4.

SCIURUS ATRICAPILLUS Schlegel.

1863. *Sciurus atricapillus* SCHLEGEL, Nederl. Tijdschr. Dierk., vol. 1, 1863, p. 27; Zoogdieren, pl. 2, fig. 1.

Doctor Abbott collected one squirrel of the *Sciurus prevostii* group at Balik Papan Bay, which is referable to *S. atricapillus*.

Mr. Miller has made the following notes on the original material of this species in the Leyden Museum:

*Sciurus atricapillus*.—Seven mounted specimens from Borneo—four from Kapuas River, one from Dusan River, one from southeastern Borneo, and one from Borneo—also one skin from Liang Koeboeng, back of Pontianak. They are very uniform, and agree perfectly with a specimen of this species in Berlin. In two of the Kapuas specimens the hairs of the tail are clear black throughout except for the narrow light base; in the third adult a few light annulations can be detected; in the immature individual there is conspicuous annulation beneath the surface. This is also present in the four others to a variable extent, but never appearing distinctly at the surface unless the hairs are disarranged. Muzzle always black, usually to a little behind eyes; feet always black; red area, dark rufous, shading toward chestnut; pale side stripe cream color, 10 mm. wide; dark stripe about same width; cheeks grizzled buffy brown.

Doctor Abbott's specimen agrees in every way with the above description, as well as with the original account. The type-locality may be taken as the Kapuas River, 4° or about 270 miles east of Pontianak, as that locality is the first mentioned in the description and the majority of the specimens came from there. The species is seen to have quite an extensive range—from the center of the island to the southeast coast, at least. *Sciurus atricapillus* probably intergrades with *S. caroli*<sup>1</sup> and its subspecies in northern Borneo.

It resembles *S. caroli griseicauda* in general external appearance more than any other member of the group that I have seen. The black color of the tail, of the nose, and adjacent parts of head, including an ill-defined ring about the eye, and the black feet of *S. atricapillus* serve to distinguish the two forms.

(For measurements, see table, p. 83.)

See bottom figure on plate 4.

<sup>1</sup> Bonhote, Ann. Mag. Nat Hist., ser. 7, vol. 7, February, 1901, p. 174.

## SCIURUS BORNEOENSIS BORNEOENSIS (Müller and Schlegel).

1907. *Sciurus borneoensis borneoensis*, LYON, Proc. U. S. Nat. Mus., vol. 33, p. 552, December 24, 1907.

Ten specimens from the Kapuas River region, northern bank, and inland on the higher ground, collected in 1905.

See figure next to the top one on plate 4.

## SCIURUS BORNEOENSIS PALUSTRIS Lyon.

1907. *Sciurus borneoensis palustris* LYON, Proc. U. S. Nat. Mus., vol. 33, p. 553, December 24, 1907.

Fifteen specimens from the Kapuas River region, northern bank, and in the lowlands, collected in 1905.

See top figure on plate 4.

## SCIURUS CARIMATÆ Miller.

1906. *Sciurus carimatæ* MILLER, Proc. U. S. Nat. Mus., vol. 31, p. 57, July 23, 1906.

In addition to the original series of specimens collected on Karimata Island, Doctor Abbott secured three additional specimens in 1908.

(For measurements, see table, p. 83.)

## SCIURUS PROSERPINÆ Lyon.

1907. *Sciurus proserpinæ* LYON, Smiths. Misc. Coll., vol. 48, No. 1659, p. 275, February 4, 1907.

Since securing the two original specimens of this species in 1905, Doctor Abbott took three others from Pulo Temaju in 1907. They differ in no respects from the earlier specimens.

(For measurements of the series, see table, p. 83.)

The relations of this squirrel are with *Sciurus borneoensis palustris* and *S. borneoensis borneoensis* from the adjacent mainland of Borneo on the north side of the Kapuas River. This is most clearly shown by its gray tail. The squirrels of the *S. prevostii* group from the islands of Karimata, Pelapis, and Panebangan, with their solid black tails and brightly colored underparts, are clearly related to *Sciurus sanggaus* from the mainland of Borneo south of the Kapuas River. The relationships of these squirrels and the positions of the islands on which they occur would indicate that the Kapuas is an ancient river, and has long separated the gray-tailed group of squirrels from the black-tailed group, and that as the land has subsided members of the two groups have been left on the elevated portions of the land, now forming islands to the north and south of the Kapuas. The river is thus older than the islands. Should *prevostii* squirrels be found on Pulo Lamakotan or Pulo Kabung they would probably be found to belong to the gray-tailed group.

## SCIURUS ARMALIS, new species.

*Type*.—Skin and skull of adult male, Cat. No. 145420, U.S.N.M., collected on Pulo Panebangan, off west coast of Borneo, May 19, 1907, by Dr. W. L. Abbott. Original number, 5257.

*Diagnostic characters*.—A member of the *prevostii* group of squirrels related to *Sciurus carimatæ* Miller,<sup>1</sup> differing in having the light shoulder area larger and practically clear gray (grizzle of black and white), without buffy admixture, and lighter colored feet.

*Color*.—Upper parts of head and body, and entire tail, black or blackish, under parts, inner sides of fore and hind legs, dull orange-rufous to ferruginous; upper surfaces of hands and feet, ochraceous to orange buff; side stripe extending from behind shoulder to heel, white or whitish, quite pure throughout its extent, but slightly mixed with blackish along the thighs; sides of head and neck, grayish, a grizzle of blackish and whitish, the darker color predominating except about the base of whiskers which is quite light; light area of shoulder largely developed, a coarse grizzle of whitish or cream color and blackish, the lighter color much in excess; outer side of upper arm, nearly clear whitish or cream color becoming buffy toward the lower arm.

*Skull and teeth*.—These show no special peculiarities. The audital bullæ are of the type found in *Sciurus carimatæ*.

*Measurements*.—For external and cranial measurements of the type and series, see table, page 83. *S. armalis* is one of the smaller members of the *prevostii* group, about like *S. carimatæ* and *S. pelapius* in size, and distinctly smaller than the form of *prevostii* squirrel found on the adjacent mainland of Borneo.

*Specimens examined*.—Twelve, all from Pulo Panebangan.

## SCIURUS PELAPIUS, new species.

*Type*.—Skin and skull of adult female, Cat. No. 145417, collected on Pulo Pelapis (South Island) off west coast of Borneo, May 30, 1907, by Dr. W. L. Abbott. Original number, 5335.

*Diagnostic characters*.—A member of the *prevostii* group; very similar to *Sciurus carimatæ* Miller,<sup>1</sup> but differing in possessing a darker shoulder and larger audital bullæ.

*Color*.—Upper parts of head and body and entire tail, black or blackish; underparts, inner sides of fore and hind legs, and upper surfaces of feet and hands, dull orange-rufous to ferruginous; side stripe, extending from behind shoulder nearly to heel, whitish or cream color, quite pure throughout its whole extent, but slightly mixed with blackish along the thighs; sides of head and neck, grayish, a grizzle of blackish and whitish, the darker color being in excess,

<sup>1</sup> Proc. U. S. Nat. Mus., vol. 31, No. 1481, p. 57, July 26, 1906.



except about base of whiskers which is quite light; upper arm, orange-ochraceous, which color spreads over the shoulder where it is not so clear due to showing of the dark bases of the hairs, and the admixture of some buffy hairs.

*Measurements of squirrels of the prevostii group.*

Name.	Locality.	Catalogue No.	Sex and age.	Head and body. <sup>1</sup>	Tail vertebrae. <sup>1</sup>	Hind foot, with claws. <sup>2</sup>	Greatest length of skull.	Interorbital constriction.	Zygomatic breadth.
<i>S. proserpinæ</i> ...	Pulo Temaju.....	142284	Female, adult.	mm. 233	mm. 230	mm. 57	mm. 53.7	mm. 22.7	mm. 34.8
Do.....	do.....	3 142285	Male, adult....	235	235	56	53.9	.....	34.0
Do.....	do.....	145412	do.....	238	225	57	53.7	22.2	33.6
Do.....	do.....	145413	Female, adult.	240	225	58	54.0	22.5	33.7
Do.....	do.....	145414	Female, young	205	215	55	48.4	20.0	29.6
<i>S. pelapius</i> .....	Pulo Pelapis, South Island.	145415	Female, old....	230	200	53	52.0	22.4	33.0
Do.....	do.....	145416	Male, adult....	223	157	50	51.6	22.0	32.0
Do.....	do.....	3 145417	Female, adult.	232	190	50	52.0	20.8	31.7
<i>S. armalis</i> .....	Panebangan Island.....	145418	Male, old....	222	204	54	52.7	20.2	31.5
Do.....	do.....	145419	Female, adult.	228	204	52	52.2	20.8	32.5
Do.....	do.....	3 145420	Male, adult....	230	210	50	54.0	20.5	31.8
Do.....	do.....	145421	do.....	223	175	52	51.2	20.0	31.2
Do.....	do.....	145422	do.....	220	205	55	53.0	20.5	32.0
Do.....	do.....	145423	do.....	230	200	53	51.8	19.6	30.6
Do.....	do.....	145424	do.....	214	208	53	51.5	20.8	30.6
Do.....	do.....	145425	Male, old....	222	205	51	51.3	19.5	32.0
Do.....	do.....	145426	Male, adult....	220	204	52	51.4	19.6	30.0
Do.....	do.....	145427	Male, young....	205	220	53	50.0	19.4	29.9
Do.....	do.....	145428	Male, old....	212	205	54	52.3	20.0	31.5
Do.....	do.....	145429	Female, old....	225	205	53	53.8	21.0	32.4
<i>S. carimalæ</i> .....	Karimata Island.....	153672	do.....	220	195	52	51.2	20.0	31.4
Do.....	do.....	153673	Female, adult.	220	213	54	51.9	19.8	30.8
Do.....	do.....	153674	Female, young adult.	220	202	54	51.2	19.2	30.6
<i>S. sanggaus</i> .....	Sukadana, west Borneo.....	145430	Male, old....	260	240	59	58.0	23.8	33.6
Do.....	do.....	145431	do.....	258	225	61	55.7	22.3	33.3
Do.....	do.....	145432	Female, adult.	255	215	57	56.0	22.0	34.4
Do.....	do.....	145433	Male, adult....	235	230	55	55.1	20.8	32.5
Do.....	do.....	145434	do.....	241	250	60	54.6	21.0	33.3
Do.....	do.....	145435	Female, old....	250	241	55	55.2	22.0	33.8
Do.....	Mouth of Sempang River.....	145441	Male, adult....	252	212	61	57.0	22.5	34.2
Do.....	Sempang River.....	145436	Female, adult.	245	235	58	54.5	20.4	33.0
Do.....	do.....	145437	do.....	246	252	61	57.8	22.0	32.8
Do.....	do.....	145438	do.....	240	225	59	55.0	22.6	34.3
Do.....	Semandang River.....	145439	do.....	260	240	60	56.7	23.4	33.7
Do.....	do.....	145440	Male, adult....	248	250	60	55.6	23.3	35.2
Do.....	Batu Jurong, southwest Borneo.	153657	Female, old....	263	250	62	58.2	22.5	33.5
Do.....	Mankol, southwest Borneo.	153658	do.....	240	240	57	56.5	23.2	34.3
Do.....	do.....	153659	Female, young adult.	245	245	53	56.1	22.4	32.6
Do.....	do.....	153660	Female, old....	255	235	60	57.0	21.8	33.6
Do.....	do.....	153661	Female, young adult.	230	240	57	53.5	22.2	32.2
Do.....	do.....	153662	Female, adult.	243	200	60	57.0	22.3	33.6
Do.....	do.....	153663	Female, young adult.	245	245	60	53.4	20.6	30.0
Do.....	Kalang Anyar, southwest Borneo.	153664	Male, adult....	248	225	58	55.8	22.3	33.5
Do.....	Lanchut, southwest Borneo	153665	Female, old....	259	230	62	56.7	23.0	34.2
Do.....	do.....	153666	Male, adult....	253	250	60	56.1	22.8	33.5
Do.....	do.....	153667	Female, adult.	248	254	59	57.2	22.6	34.2
Do.....	do.....	153668	Female, old....	243	220	59	57.4	23.4	35.0
Do.....	Surok, southwest Borneo	153669	Male, adult....	260	255	64	57.4	22.8	33.4
Do.....	do.....	153670	Male, old....	260	260	62	57.0	24.2	34.6
Do.....	Mankol, southwest Borneo	153671	Female, adult.	260	215	62	57.5	23.7	34.5
<i>S. atricapillus</i> ...	Balik Papan Bay, southeast Borneo.	154292	do.....	256	245	60	56.4	21.5	34.5

<sup>1</sup> Collector's measurements.

<sup>2</sup> Measured by writer after relaxing feet in water.

<sup>3</sup> Type.

*Skull and teeth.*—These show no striking peculiarities, but the audital bullæ are distinctly more inflated than they are in the closely related *Sciurus carimatæ*, especially noticeable in the anterior segment of the bullæ.

*Measurements.*—For external and cranial measurements of the type and series, see table on p. 83. *S. pelapius* is one of the smaller members of the *prevostii* group, about the same size as *S. carimatæ*.

*Specimens examined.*—Three, all from South Island, Pelapis.

*Remarks.*—*Sciurus pelapius* is very closely related to the near-by *S. carimatæ*, the only distinguishing characters being its darker and "redder" shoulder and larger audital bullæ. Two specimens in the *carimatæ* series have shoulders nearly as dark as those of *pelapius*, but none that I have seen shows the more inflated bullæ.

SCIURUS DULITENSIS (Bonhote).

1901. *Sciurus vittatus dulitensis* BONHOTE, Ann. Mag. Nat. Hist., ser. 7, vol. 7, p. 451, May, 1901.

1907. *Sciurus dulitensis*, LYON, Proc. U. S. Nat. Mus., vol. 33, No. 1577, p. 555, December 24, 1907. (Kapuas River region.)

Since he collected nine specimens of plantain squirrels from the Kapuas River region Dr. W. L. Abbott has secured eleven additional specimens in southwestern Borneo, eight in southeastern Borneo, and one on Pulo Laut. As far as the general coloration of the upper parts and side stripes is concerned all the Bornean specimens are fairly constant. They vary considerably, however, as to the brightness of the under parts, as may be seen even in specimens from one locality. The single specimen from Pulo Laut does not seem to be separable from the others.

It is noteworthy that nearly all the specimens from the Kapuas River region, as well as several in the U. S. National Museum from northern Borneo, have the entire under side of the tails distinctly reddish or rufous, while nearly all the others from Borneo have the entire under side of the tail generally grayish. This character is not absolutely constant and at best could only be considered a subspecific one. The difference can not be attributed to season, sex, or age. Without more specimens, especially well-prepared skins from northern Borneo, it does not for the present seem advisable to recognize this difference by name.

It may not be without interest to point out how easily the "red" color of the underparts of the *Sciurus vittatus* group of squirrels may become altered. There are in the museum two specimens of *Sciurus dulitensis* from north Borneo, collected by C. F. Adams in 1887. At that time they were preserved by some pickling solution, probably salt and alum. The underparts are now a dull vinaceous-cinnamon, instead of the usual bright ochraceous colors. Some other specimens

collected in Sarawak by Hose, which have recently had their skulls removed, and have been made over into modern study skins, have the original colors of the underparts more or less dulled and rendered somewhat pinkish. The fluid used to relax these skins in the remaking was probably alcohol and water. In order to relax the feet in the large number of squirrels of the *vittatus* group recently collected by Dr. W. L. Abbott, the unlabeled hind foot and adjacent part of leg of each specimen was soaked for about twenty-four hours in tap water placed in a galvanized-iron receptacle. In a great many of the specimens the bright ochraceous-rufous colors of the inner side of the leg have become dulled and more pinkish on the foot and leg that was soaked. In the last case it can hardly be probable that the plain water brought about the change in color. It is more likely due to the preservative, probably arsenic or a mixture of arsenic and alum, used on the inside of the skin, and which had come through the skin to the hairs by solution and osmosis.

SCIURUS LAMUCOTANUS, new species.

*Type*.—Skin and skull of adult female, Cat. No. 145405, collected on Pulo Lamukotan, off west coast of Borneo, May 8, 1907, by Dr. W. L. Abbott. Original number, 5201.

*Diagnostic characters*.—A “red” bellied, “red” footed member of the *Sciurus vittatus* group, differing from *S. dulitensis* of the neighboring mainland of Borneo in having a generally more ochraceous tone on the upper parts, lighter under parts, broader but less clear dark sides tripe and more buffy light side stripe.

*Color*.—Type: Upper parts of head and body, a fine grizzle of ochraceous-buff and blackish, the two colors about equally prominent; upper surface of tail similar but grizzle coarser, and the ochraceous-buff darkening to ochraceous and tawny ochraceous at the tip; underside of tail with the ochraceous-buff replaced by ochraceous and tawny ochraceous, the latter colors being in excess of the black; light side stripe (5 by 65 mm.) buffy; dark side stripe (12 by 80 mm.) blackish, sprinkled with a few light hairs; under parts and inner sides of fore and hind legs ochraceous-buff; outer sides of fore and hind legs similar to adjacent parts of body; fore and hind feet similar to outer side of legs, but more ochraceous-buff; inner side of ears dull tawney ochraceous; outer side similar to head; orbital ring and region about mouth ochraceous-buff. There is some little difference shown in certain individuals of the series as to brightness of under parts, but all are essentially like the type.

*Skull and teeth*.—These show no special characteristics and apparently do not differ from those of examples of *Sciurus dulitensis* from Borneo.

*Measurements.*—For external and cranial measurements see table, pages 90 and 91.

*Specimens examined.*—Eight, all from Pulo Lamukotan.

*Remarks.*—While *Sciurus lamucotanus* is sufficiently distinct from the Bornean *S. dulitensis* to be regarded as a separate species, it is not, however, a highly differentiated form.

SCIURUS SERUTUS Miller.

1906. *Sciurus serutus* MILLER, Proc. U. S. Nat. Mus., vol. 33, p. 58, July 23, 1906.

One specimen collected on Pulo Serutu, Karimata Islands, in 1904.

SCIURUS DATUS, new species.

*Type.*—Skin and skull of adult female, Cat. No. 145393, U.S.N.M., collected on Pulo Datu, off west coast of Borneo, May 2, 1907, by Dr. W. L. Abbott. Original number, 5153.

*Diagnostic characters.*—A “red” bellied, “red” footed member of the *Sciurus vittatus* group, similar to *S. dulitensis* of Borneo, but distinctly smaller, and with wider dark side stripes.

*Color.*—Type: Upper parts of head and body a fine grizzle of blackish and a dull light cream-buff, in some lights appearing dull olive-buff, the outer light annulations of the hairs being lighter than the inner more buffy ones; upper surface of tail similar in color to upper parts of body, but grizzling much coarser, underside of tail with the cream-buff largely replaced by ochraceous, especially in middle line, where it is the predominating color; light side stripe (4 by 65 mm.) dull cream color; dark side stripe (10–15 by 80 mm.) blackish, sprinkled with a few light hairs; underparts and inner sides of fore and hind legs ochraceous-buff, rather bright; outer side of fore and hind legs similar to adjacent parts of body; fore and hind feet generally similar to legs, but more ochraceous-buffy; outside of ears, like top of head, inside more ochraceous buffy; orbital ring pinkish-buff. The series of specimens of *Sciurus datus* is very uniform in coloration, and differs in no essentials from the type. Two examples have the hairs of the underparts rather worn, allowing the bases to show and darken and dull the ochraceous buff.

*Skull and teeth.*—Aside from their distinctly smaller size these show no noteworthy characteristics.

*Measurements.*—For external and cranial measurements see table page 90.

*Specimens examined.*—Six, all from Pulo Datu.

*Remarks.*—In the color of the under parts and of the side stripes *Sciurus datus* closely resembles *S. lamucotanus*; in the color of the upper parts it more nearly resembles *S. dulitensis* from Borneo. It can be readily distinguished from either, however, by its distinctly smaller size.



## SCIURUS SIRIENSIS, new species.

*Type*.—Skin and skull of adult male, Cat. No. 151768, U.S.N.M., collected on Pulo Mata Siri, Java Sea, December 7, 1907, by Dr. W. L. Abbott. Original number, 5580.

*Diagnostic characters*.—A very pale form of the "red" footed, "red" bellied *Sciurus vittatus* group of squirrels, generally similar to *S. lautensis* Miller,<sup>1</sup> but slightly more pallid, and with larger audital bullæ.

*Color*.—Upper parts of body a fine grizzle of cream-buff and blackish, the cream-buff being in excess; tail both above and below similar, but the grizzle much coarser; under parts, including throat and inner side of fore and hind legs, pale ochraceous buff; light side stripe (17 by 60 mm.) whitish cream color; dark side stripe about the same length and width, dull pale blackish; top of head a grizzle of buffy and blackish, the former in excess; sides of head generally buffy; outside of hind legs similar in color to back; outside of forelegs similar to adjoining parts of body, but more buffy; fore and hind feet generally buffy to ochraceous buffy; ears similar to adjoining parts of body; whiskers black.

*Skull and teeth*.—These show no special peculiarities and very closely resemble those of *Sciurus lautensis*. The bullæ, however, are distinctly larger in *S. siriensis*, so that the two species are easily distinguished.

*Measurements*.—See table, page 90.

*Specimens examined*.—Six, all from Pulo Mata Siri.

*Remarks*.—The occurrence of two species so closely resembling each other as *Sciurus lautensis* and *S. siriensis* on islands of opposite coasts of Borneo is interesting. It is probably the result of similar environments, but I have been unable to find any details concerning the conditions on the two islands.

## SCIURUS ARENDNIS, new species.

*Type*.—Skin and skull of adult male, Cat. No. 154276, U.S.N.M., collected on Arends Island, Java Sea, November 24, 1908, by Dr. W. L. Abbott. Original number, 6251.

*Diagnostic characters*.—A member of the *Sciurus vittatus* group of squirrels, distinguished by its small size, light under parts, and whitish axillary hairs; rather closely related to its geographic neighbor, *Sciurus siriensis*, from Pulo Mata Siri (see above), but smaller, with more whitish hairs on under parts, and with darker upper parts.

*Color*.—Type: Upper parts of head, neck, and body, and outer surfaces of fore and hind legs and upper surface of feet, a fine grizzle

<sup>1</sup> Proc. Wash. Acad. Sci., vol. 3, p. 128, March 26, 1901, Pulo Laut. Natuna Islands.

of pale ochraceous buff and blackish, the two colors about equally mixed; tail, both above and below similar, but the grizzle coarser and the ochraceous buff predominating on the underside; under parts, and inner side of hind legs, a color closely approaching Ridgway's pink buff, becoming whitish cream color in axillary region and about chin, and nearly as light on inner side of fore legs; light side stripe (6 by 50 mm.) buffy cream color, ill defined; black side stripe (12 by 45 mm.) blackish, strongly lined with whitish, and many of the hairs with narrow ochraceous buff rings; region of nose, sides of head and neck similar to upper parts, but the ochraceous buff deeper and more conspicuous; a rather poorly defined eyering; ears, inside and out, similar to upper parts.

*Skull and teeth*.—Aside from its slightly smaller size and relatively heavier teeth, the skull and teeth of *Sciurus arendsis* show no differences from those of numerous related forms.

*Measurements*.—See table, page 90.

*Specimens examined*.—Five, all from Pulo Arends.

*Remarks*.—*Sciurus arendsis* is simply another of the numerous races of *Sciurus vittatus*, produced by isolation on various Malayan islands. It closely resembles its geographic neighbors, *S. siriensis*, from Pulo Mata Siri, and *S. dulitensis*, from the Bornean mainland. It differs from *S. siriensis* in its smaller size, darker upper parts, and in the possession of numerous white hairs on the under parts, as in *S. vittatus albescens* (Bonhote)<sup>1</sup> from northern Sumatra. From the mainland *S. dulitensis* it is distinguished by its smaller size, lighter coloration, both above and below, and less conspicuous side stripes.

SCIURUS POLIOPUS, new species.

*Type*.—Skin and skull of adult male, Cat. No. 151789, U.S.N.M., collected at Pamukang Bay, southern Borneo, April 5, 1908, by Dr. W. L. Abbott. Original number, 5923.

*Diagnostic characters*.—A member of the *vittatus* group distinguished by a very dull "red" belly and conspicuous gray legs and feet.

*Color*.—Upper parts of head and body, a fine grizzle of pale dull buff-yellow and blackish, the two colors about equally mixed; thighs and shoulders similar, but the buffy color becoming gradually replaced by a light gray on the outer side of the fore and hind legs and on feet, lower parts of inner side of fore and hind legs also grayish; tail, similar to upper parts of body but the grizzle very coarse, appearing somewhat annulated, and with the buffy color very light above, but darker underneath; under parts, a very dull ochraceous color, ranging from almost clay color in the type to a very dark

<sup>1</sup> Ann. Mag. Nat. Hist., ser. 7, vol. 7, May, 1901, p. 446.

tawny ochraceous in the specimen from Klumpang Bay; inner side of the upper portions of fore and hind legs similar to under parts of body; light side stripe (about 75 by 7 mm.), dull cream color; dark side stripe about the same length, but nearly twice as wide, blackish, fairly clear in color or sprinkled with a few buffy hairs. A suggestion of the grayish color of the feet is seen about the extreme anterior portion of head.

*Skull and teeth.*—These show no special peculiarities, and I have been unable to find characters in them by which they may be distinguished from related forms.

*Measurements.*—See table, page 91.

*Specimens examined.*—Three, the type from Pamukang Bay, one from Klumpang Bay, and one from the Saratok River.

*Remarks.*—*Sciurus poliopus* needs no comparison with any of the other known members of the *vittatus* group. The combination of "red" belly and gray feet occurs in no other members of the group so far as I am aware, with the exception of the species to be described below.

SCIURUS MARINSULARIS, new species.

*Type.*—Skin and skull of adult male, Cat. No. 151777, collected on Pulo Laut, off southeastern Borneo, December 17, 1907, by Dr. W. L. Abbott. Original number, 5619.

*Diagnostic characters.*—A member of the *vittatus* group, with a red belly and gray feet similar to *Sciurus poliopus*, described above, but with the under parts ochraceous-rufous and with less gray appearing on portion of legs adjacent to feet.

*Color*—Type: Upper parts of head and body and outer surfaces of fore and hind legs a fine grizzle of blackish and a color intermediate between a light tawny-olive and buff-yellow, the two colors about in equal proportions; under parts, including inner sides of fore and hind legs, ochraceous-rufous; upper surfaces of fore and hind feet, with the buffy color of the upper parts replaced by light grayish, tail similar to the upper parts, but the buffy portions of the hair lighter and the grizzle coarser, the tail in certain lights and portions appearing annulated; light side stripe (about 75 by 10 mm.), buff; dark side stripe (about 75 by 5 mm.), blackish. A suggestion of the grayish color of the feet is seen about the extreme anterior portion of the head.

*Skull and teeth.*—These show no special peculiarities, and I have been unable to find characters in them by which they may be distinguished from related forms.

*Measurements.*—See table, page 91.

*Specimens examined.*—Six from Pulo Laut and two from Pulo Sebuku.

*Remarks.*—*Sciurus marinsularis* needs comparison only with *S. poliopus*, described above. The two species may be more closely related than the descriptions would indicate. The specimens representing the mainland species are evidently in not so fresh a pelage, which might account, in part at least, for the striking difference in color of the under parts of the two forms. The greater extension of gray about the feet and legs of the mainland animal serves to distinguish them readily, and would not appear to be produced by wear. It is unfortunate that no cranial or dental characters can be found to separate the gray-footed squirrels from the buffy-footed forms. It hardly seems probable that the difference in color of the feet and legs can be dimorphic. Among the many squirrels of the *vittatus* group collected by Doctor Abbott it has never been noticed before. The only other gray-footed squirrels of this group in the U. S. National Museum are specimens of the gray-bellied *Sciurus notatus* from Java. All the other gray-bellied and "red"-bellied species have the feet in general concolor with the upper parts, or often more buffy or ochraceous in color.

*Measurements of squirrels of the vittatus group.*

Name.	Locality.	Catalogue No.	Sex and age.	Head and body. <sup>1</sup>	Tail vertebrae. <sup>1</sup>	Hind foot, with claws. <sup>2</sup>	Greatest length of skull.	Interorbital constriction.	Zygomatic breadth.
<i>S. siriensis</i> .....	Pulo Mata Siri.....	<sup>3</sup> 151768	Male, adult.....	mm. 198	mm. 174	mm. 43	mm. 47.3	mm. 17.0	mm. 28.9
Do.....	do.....	151769	do.....	202	150	46	47.3	16.7	28.0
Do.....	do.....	151771	do.....	195	175	44	.....	17.0	28.2
Do.....	do.....	154281	do.....	210	150	49	47.8	17.3	.....
Do.....	do.....	154283	do.....	210	173	47	46.5	17.3	28.7
Do.....	do.....	154284	Male, young adult.....	180	180	49	41.6	16.3	26.2
Do.....	do.....	154286	Male, adult.....	207	185	49	47.7	16.4	27.8
Do.....	do.....	151770	Female, adult.....	198	175	44	46.7	16.7	28.0
Do.....	do.....	151772	do.....	195	175	45	46.2	16.2	27.2
Do.....	do.....	151773	do.....	198	172	46	46.3	15.6	27.7
Do.....	do.....	154282	do.....	200	195	47	46.8	17.6	.....
Do.....	do.....	154285	Female, young adult.....	200	173	48	46.5	16.1	26.0
Do.....	do.....	154287	Female, adult.....	200	165	46	45.5	16.0	27.5
<i>S. arendsii</i> .....	Pulo Arends.....	<sup>3</sup> 154276	Male, old.....	194	152	45	46.5	16.6	26.0
Do.....	do.....	154277	Male, adult.....	192	128	45	.....	.....	.....
Do.....	do.....	154278	Female, young adult.....	187	165	43	.....	16.3	25.5
Do.....	do.....	154279	do.....	183	172	44	.....	16.0	25.2
Do.....	do.....	154280	Female, adult.....	195	150	44	46.0	16.4	25.8
<i>S. datu</i> .....	Pulo Datu.....	145395	Male, adult.....	202	195	48	46.0	16.2	27.0
Do.....	do.....	145396	Male, old.....	208	180	48	47.3	15.6	27.5
Do.....	do.....	145397	Male, young adult.....	196	180	48	45.0	15.7	25.2
Do.....	do.....	<sup>3</sup> 145393	Female, adult.....	208	195	50	46.4	15.3	26.2
Do.....	do.....	145394	Female, young adult.....	205	185	47	45.7	15.3	25.7
Do.....	do.....	145398	Female, adult.....	204	186	48	46.7	16.0	27.0
<i>S. lamucotanus</i> ..	Pulo Lamukotan.....	145399	Male, old.....	225	185	49	50.2	16.5	29.5
Do.....	do.....	145400	Male, adult.....	225	190	50	51.8	18.0	29.5
Do.....	do.....	145401	do.....	217	195	50	51.2	.....	.....

<sup>1</sup> Collector's measurements.

<sup>2</sup> Measured by writer after feet had been relaxed by soaking in water 24 hours.

<sup>3</sup> Type.



Measurements of squirrels of the *vittatus* group—Continued.

Name.	Locality.	Catalogue No.	Sex and age.	Head and body.	Tail vertebrae.	Hind foot, with claws.	Greatest length of skull.	Interorbital constriction.	Zygomatic breadth.
				mm.	mm.	mm.	mm.	mm.	mm.
<i>S. lamucotanus</i> .	Pulo Lamukotan.....	145406	Male adult....	214	198	51	51.3	17.0	29.8
Do.....	do.....	145402	Female, adult....	220	178	50	50.6	17.5	30.2
Do.....	do.....	145403	do.....	225	158	50	50.8	17.2	30.0
Do.....	do.....	145404	Female, young adult.	216	190	51	49.8	18.7	29.6
Do.....	do.....	145405	Female, adult....	224	196	51	50.4	16.8	29.0
<i>S. dulitensis</i> .....	Sukadana.....	145407	Male, adult....	210	175	48	49.4	17.7	29.0
Do.....	do.....	145408	do.....	212	190	50	48.3	16.4	28.5
Do.....	do.....	145409	do.....	215	185	47	49.0	17.5	28.4
Do.....	do.....	145410	Female, adult....	215	185	49	48.8	17.3	29.5
Do.....	Sempang River.....	145411	do.....	221	182	50	51.4	18.7	30.5
Do.....	Batu Jurong.....	153675	Male, immature.	185	180	48	47.3	16.3	27.5
Do.....	do.....	153676	Male, young adult.	190	175	47	45.6	15.2	27.2
Do.....	do.....	153677	Male, adult....	206	182	50	49.6	17.2	28.4
Do.....	do.....	153678	Male.....	213	190	49	.....	.....	.....
Do.....	Kendawangan River.....	153679	Female, adult....	215	180	47	47.9	18.4	.....
Do.....	do.....	153680	do.....	206	192	49	49.0	16.5	28.1
Do.....	Klumpang Bay.....	151785	Male.....	190	190	49	.....	.....	.....
Do.....	do.....	151784	Female, adult....	205	195	49	49.2	17.3	28.3
Do.....	do.....	151786	do.....	215	185	47	49.8	16.5	29.8
Do.....	Tjantung.....	151787	Male, adult....	203	190	48	48.0	17.4	28.4
Do.....	Balik Papan Bay.....	154289	do.....	203	185	50	49.1	18.6	30.0
Do.....	do.....	154290	do.....	203	177	51	49.7	18.0	28.7
Do.....	do.....	154291	Male, young adult.	206	195	53	50.7	17.7	28.8
Do.....	do.....	154288	Female, adult....	210	184	51	50.0	17.9	29.4
Do.....	Pulo Laut.....	151779	Female.....	205	190	48	49.7	17.5	27.7
<i>S. poliopus</i> .....	Klumpang Bay.....	151783	Male.....	195	170	46	45.5	19.0	28.5
Do.....	Saratok River.....	151788	do.....	200	195	48	48.0	18.0	30.8
Do.....	Pamukang Bay.....	151789	Male, adult....	205	190	48	48.6	17.8	.....
<i>S. marinsularis</i> .....	Pulo Laut, east side.....	151774	Male.....	212	198	49	.....	.....	.....
Do.....	Pulo Laut.....	151776	do.....	210	175	49	46.8	18.3	29.8
Do.....	do.....	151777	Male, young adult.	205	180	48	48.6	.....	.....
Do.....	do.....	151780	Male.....	205	190	49	48.4	18.0	30.3
Do.....	do.....	151778	Female.....	210	200	49	.....	18.0	30.2
Do.....	do.....	151775	Female, adult....	211	185	48	48.8	17.4	29.5
Do.....	Pulo Sebuku.....	151781	do.....	205	176	47	47.3	17.2	28.7
Do.....	do.....	151782	Female.....	205	175	47	48.0	18.0	29.8

<sup>1</sup> Type.

## SCIURUS LOWII Thomas.

1892. *Sciurus lowii* THOMAS, Ann. Mag. Nat. Hist., ser. 6, vol. 9, p. 253, March, 1892.

Two specimens were secured, an adult male from the Kendawangan River, southwestern Borneo, and an adult female from the Saratok River, southeastern Borneo.

(For measurements, see table, p. 92.)

## SCIURUS PARVUS Miller.

1901. *Sciurus parvus* MILLER, Proc. Biol. Soc. Wash., vol. 14, p. 33, April 5, 1901.

Type-locality, Nulu, Sarawak, Borneo.

Three small squirrels, members of the *tenuis* group, were secured along the Sempang River. They do not differ essentially from specimens of *Sciurus parvus* from northern Borneo.

(For measurements, see table, p. 92.)



## SCIURUS BORNEENSIS (Gray).

1867. *Macrozus rufogaster*, var. *borneensis* GRAY, Ann. Mag. Nat. Hist., ser. 3, vol. 20, 1867, p. 283.  
 1901. *Sciurus hippurus grayi* BONHOTE, Ann. Mag. Nat. Hist., ser. 7, vol. 7, February, 1901, p. 171, footnote.  
 1907. *Sciurus grayi*, LYON, Smiths. Misc. Coll., vol. 50, April 8, 1907, p. 28.

One specimen, an adult male (Cat. No. 154293), from Balik Papan Bay, is apparently indistinguishable from specimens of *Sciurus borneensis* in the U. S. National Museum collection from North Borneo. (For measurements, see table, below.)

## SCIURUS HIPPURELLUS Lyon.

1907. *Sciurus hippurellus* LYON, Smiths. Misc. Coll., vol. 50, p. 27, April 8, 1907.  
 1907. *Sciurus hippurellus*, LYON, Proc. U. S. Nat. Mus., vol. 33, p. 557, December 24, 1907.

Two from the Landak River and one from the Kapuas, collected in 1905.

## Measurements of squirrels.

Name.	Locality.	Catalogue No.	Sex and age.	Head and body. <sup>1</sup>	Tail vertebra. <sup>1</sup>	Hind foot, with claws. <sup>2</sup>	Greatest length of skull.	Zygomatic breadth.	Interorbital constriction.
<i>Lariscus diversus</i> ....	Sukadana.....	145383	Male, old.....	mm. 193	mm. 100	mm. 48	mm. 49.6	mm. 26.6	mm. 13.0
Do.....	Kendawangan River.....	153683	Female, adult.....	196	104	48	49.4	25.8	13.0
Do.....	Saratok River.....	151791	Male, young.....	142	95	44	.....	.....	.....
Do.....	Balik Papan Bay.....	154294	Male, adult.....	187	113	50	49.0	26.4	12.8
Do.....	do.....	154295	Female, adult.....	197	110	50	49.7	27.6	13.3
Do.....	do.....	154296	do.....	185	115	50	49.7	26.7	13.8
Do.....	do.....	154297	Female, young adult.....	.....	.....	.....	46.0	25.3	12.4
<i>Sciurus lowii</i> .....	Kendawangan River.....	153681	Male, adult.....	140	.....	38	38.6	21.5	11.5
Do.....	Saratok River.....	151790	Female, adult.....	150	80	38	39.4	23.2	12.5
<i>Sciurus parvus</i> .....	Sempang River.....	145384	Female, young adult.....	140	112	38	36.9	20.8	12.2
Do.....	do.....	145385	Male, adult.....	155	126	39	.....	22.7	13.0
Do.....	do.....	145386	Female, adult.....	142	123	38	38.5	22.4	12.0
<i>Sciurus borneensis</i> ..	Balik Papan Bay.....	154293	Male, adult.....	244	271	64	57.7	33.0	19.9

## RATUFA EPHIPPIMUM (Müller).

- 1838-39. *Sciurus ephippium* MÜLLER, Tijdschr. Natuurl. Gesch. Physiol., vol. 5, p. 147.

Doctor Abbott secured seventeen specimens, practically topotypes, of *R. ephippium* from the region of Klumpang and Pamukang bays. Müller's figure<sup>3</sup> is an excellent representation of this species as shown by unbleached specimens of the present series. The side of head and top of nose in the plate, however, are too "red." In Doctor Abbott's specimens those portions of the head are similar in

<sup>1</sup> Collector's measurements.

<sup>2</sup> Measured by writer after relaxing in water for 24 hours.

<sup>3</sup> Verh. Nat. Gesch. Nederl. Bezitt., pl. 13, 1839-1844.

color to the base of whiskers in Müller's plate. The grizzling seen along the edge of the dorsal stripe in the plate is less noticeable in the specimens.

Regarding the type-locality of this species, Mr. Gerrit S. Miller, jr., who examined in Leiden, in 1904, the type, an adult male mounted, remarked: "No locality can be given beyond southeastern Borneo, in the low country."

(For measurements, see table, p. 96.)

RATUFA COTHURNATA, new species.

*Type*.—Skin and skull of adult female, Cat. No. 145378, collected at foot of Mount Palung, near Sukadana, western Borneo, February 9, 1907, by Dr. W. L. Abbott. Original number, 5537.

*Diagnostic characters*.—A member of the *ephippium* group, differing from true *ephippium* in having the dark dorsal area less sharply defined and general coloration not so bright, most closely related to *Ratufa ephippium baramensis* Bonhote,<sup>1</sup> but differing in having the thighs concolor with under parts of body.

*Color*.—Type: Upper parts of head and body a mixture of tawny ochraceous and blackish, the former more conspicuous anteriorly and laterally, the latter more prominent in the dorsal line and posteriorly. The mixture occurs as a grizzle, except over the shoulders, where the tawny-ochraceous is essentially clear and unmixed, and on the lower back, where the blackish is unmixed and spreads out laterally nearly as far as the femoral spots. On the head between the ears the blackish is quite pure. Cheeks and sides of neck rather dark tawny-ochraceous. Under parts buff or buffy. Fore and hind legs and feet buff to ochraceous-buff, the inner sides of the legs lighter than the outer. General color of tail above blackish, the bases of the hairs whitish, marginal portions of under side of tail blackish; central portion, including short appressed hairs, ochraceous-buff. Ears inside and out dull ochraceous. The type is one of the brightest and freshest-looking in the series. The majority of specimens are duller and lighter in color, the tawny-ochraceous becoming ochraceous-buff or buffy and the under parts correspondingly lighter, the blackish becoming brownish. One specimen, Cat. No. 145381, from Kumbang River, is very much bleached and worn, the pelage in places having a singed appearance.

*Skull and teeth*.—Apparently there are no characters by which the skulls and teeth of *R. cothurnata* can be distinguished from those of *R. ephippium*.

*Measurements*.—The external and cranial measurements of *R. cothurnata* are essentially the same as they are in *R. ephippium*, the hind foot and greatest length of skull averaging, however, a trifle less. The hind foot in *R. cothurnata* ranges from 81 to 87 mm. and

<sup>1</sup>Ann. Mag. Nat. Hist., ser. 7, vol. 5, p. 496, June, 1900. Type-locality, Baram district, Sarawak.

the skull from 62.5 to 66; in *R. ephippium* these ranges are 85 to 90 and 63.4 to 68.5. (For measurements of the series see table, p. 96.)

*Specimens examined*.—Twenty-three, from western and southwestern Borneo. (For exact localities see table, p. 96, four from along the Kapuas River not included.)

*Remarks*.—This is the same species that I called *Ratufa ephippium* (Müller) in 1907.<sup>1</sup> At that time there were no specimens of true *ephippium* in the museum collection. It is not at all unlikely that the forms of *Ratufa* on the mainland of Borneo, *baramensis*, *sandakanensis*, *cothurnata*, and *ephippium*, represent local races of one species, but at present intergradation is not known.

RATUFA GRISEICOLLIS, new species.

*Type*.—Skin and skull of adult male, Cat. No. 145372, collected on Panebangan Island, west coast of Borneo, May 24, 1907, by Dr. W. L. Abbott. Original number, 5315.

*Diagnostic characters*.—A richly colored species of the *ephippium* group related to *Ratufa cothurnata* above, from the neighboring mainland of Borneo, but back darker, sides and under parts more rufous, and sides of neck gray.

*Color*.—Upper parts of head and body in the middle line blackish; some light-colored hairs over nose, and in the type over back of neck; sides of body and shoulders rich cinnamon-rufous, grizzled with blackish; the shoulders contrasting with the black of the back, but elsewhere the latter color blends in with the sides; under parts of neck and body and inner side of thighs and legs orange-buff, rather richer than that of Ridgway; thighs similar to sides, becoming dull orange-rufous on the hind feet; upper and lateral aspect of tail brownish black, inner half of the long hairs on under side of tail buffy, the short hairs in median line tawny with slight grizzling of blackish.

*Skull and teeth*.—I can find no characters by which the skull and teeth of *Ratufa griseicollis* may be distinguished from those of *R. ephippium* or *R. cothurnata*.

*Measurements*.—See table, page 96.

*Specimens examined*.—Three, all from Pulo Panebangan.

*Remarks*.—*Ratufa griseicollis*, while clearly related to *R. cothurnata*, from Borneo, is very distinct and easily recognized by its gray neck, rufous under parts, and generally richer coloration. Head and body measurements of *R. griseicollis* are somewhat greater than corresponding measurements in mainland specimens.

RATUFA VITTATA, new species.

*Type*.—Skin and skull of adult female, Cat. No. 151758, collected at Saratok, on Pulo Laut, off southeast coast of Borneo, December 19, 1907, by Dr. W. L. Abbott. Original number, 5632.

<sup>1</sup> Proc. U. S. Nat. Mus., vol. 33, No. 1577, p. 557, December 24, 1907.

*Diagnostic characters.*—A member of the *ephippium* group, but differing from typical *ephippium* in having a more sharply defined dorsal stripe which does not extend forward beyond the shoulders, and in having a lighter cream-colored head.

*Color.*—Upper parts and sides of body with exception of dorsal stripe nearest Ridgway's ochraceous. This color is almost pure, but on close inspection, especially with a glass, dark tips to many of the hairs may be seen. The basal portions of the hairs on this part of the body are blackish slate. Dorsal stripe and all of the tail except in the middle line on the underside black or blackish. The stripe gradually begins, due to increasing extent of dark tips of the hairs, just behind the shoulders. It soon becomes prominent, varying in width in different specimens from about 30 to 50 mm. It is continuous with the color of the tail. Top and sides of head, just posterior to the ears, whitish, irregularly sprinkled with blackish due to dark-colored tips to the hairs. The dark-colored tips have a tendency to accumulate on the point of the nose and on the top of the head just anterior to the ears. Ears concolor with head. Underparts of body and throat varying from light buff to buff-yellow. Outer sides of legs and feet generally similar to sides of body, but slightly lighter, inner side of legs and femoral spot similar to underparts. Middle line of underside of tail similar to underparts or slightly darker.

*Skull and teeth.*—There are no evident peculiarities by which the skulls and teeth of *R. vittata* can be distinguished from those of *R. ephippium*.

*Measurements.*—For external and cranial measurements of the type and series see table, page 96.

*Specimens examined.*—Five, all from Saratok, Pulo Laut, south-eastern Borneo.

**RATUFA VITTATULA, new species.**

*Type.*—Skin and skull of adult male, Cat. No. 151762, collected on Pulo Sebuku, southeastern Borneo, January 2, 1908, by Dr. W. L. Abbott. Original number, 5720.

*Diagnostic characters.*—Practically identical with *R. vittata*, but smaller; hind foot 78–81 mm. instead of 84–89, and greatest length of skull 61–63.2 instead of 66–66.8.

*Color.*—The colors of *R. vittatula* are identical with those of *R. vittata* except that the light color of the head extends back on the side of the neck.

*Skull and teeth.*—The skulls and teeth of *R. vittatula* are distinctly smaller than they are in *R. vittata*. The rostrum in the smaller species is relatively shorter than it is in the larger one.



*Measurements.*—The external and cranial measurements of *R. vittatula* are all smaller than the corresponding measurements of *R. vittata*. (See table below.)

*Specimens examined.*—Seven, all from Pulo Sebuku.

*Measurements of ratufas.*

Name.	Locality.	Catalogue No.	Sex and age.	Head and body. <sup>1</sup>	Tail vertebrae. <sup>1</sup>	Hind foot, with claws. <sup>2</sup>	Greatest length of skull.	Zygomatic breadth.	Interorbital constriction.
<i>R. griseicollis</i> ...	Pulo Panebangan.....	<sup>3</sup> 145372	Male, adult....	mm. 366	mm. 420	mm. 86	mm. 67.0	mm. 40.7	mm. 27.4
Do.....	do.....	145371	Female, adult....	360	442	85	65.2	40.0	27.5
Do.....	do.....	145373	.....do.....	360	415	83	65.6	40.2	27.5
<i>R. cothurnata</i> ...	Sukadana.....	145375	.....do.....	335	415	84	66.0	41.4	26.0
Do.....	do.....	145376	.....do.....	340	420	86	65.6	41.8	27.3
Do.....	Sempang River, mouth.....	145379	Male, adult....	330	380	81	62.5	38.2	25.0
Do.....	do.....	145380	Female, adult....	335	405	82	65.3	40.0	27.0
Do.....	Sungei Matan.....	145374	Male, adult....	345	390	87	65.4	39.0	26.0
Do.....	Kumbang River.....	145381	.....do.....	330	387	84	65.0	39.6	27.2
Do.....	do.....	145382	Male, young....	300	390	81	63.3	37.0	25.0
Do.....	Mount Palung.....	145377	Female, youngish.	340	455	86	65.4	39.2	25.8
Do.....	Mount Palung, foot of.....	<sup>3</sup> 145378	Female, adult....	350	390	83	64.0	38.5	25.5
Do.....	Kendawangan River.....	153647	.....do.....	330	395	83	66.5	40.0	25.4
Do.....	do.....	153648	Male, adult....	340	393	84	65.8	39.2	25.5
Do.....	do.....	153649	.....do.....	333	388	77	64.2	40.7	25.6
Do.....	do.....	153650	Female, old....	335	385	82	63.9	38.4	25.6
Do.....	do.....	153651	Male, adult....	315	373	80	61.3	36.2	24.2
Do.....	do.....	153652	Female, old....	345	405	79	63.1	40.6	26.5
Do.....	do.....	153653	Male, young adult.	305	335	79	61.8	36.8	23.0
Do.....	do.....	153654	Male, adult....	345	410	82	63.5	40.3	25.0
Do.....	do.....	153655	Female, adult....	345	410	84	65.0	40.4	27.8
Do.....	do.....	153656	Male, nearly adult.	295	420	80	60.8	36.5	24.2
<i>R. ephippium</i> ...	T. Batu, Klumpang Bay.....	151743	Male, adult....	355	415	85	67.0	41.7	26.5
Do.....	do.....	151744	.....do.....	355	405	86	66.4	39.5	25.5
Do.....	do.....	151745	.....do.....	350	380	84	65.7	41.0	27.0
Do.....	do.....	151746	.....do.....	368	445	90	67.2	39.8	24.5
Do.....	do.....	151747	Female, adult....	350	410	86	65.5	40.2	26.8
Do.....	Pulo Soren, Klumpang Bay.....	151748	Female, old....	343	420	87	68.5	40.6	25.3
Do.....	Saratok R., Klumpang Bay.....	151750	Male, adult....	342	450	88	65.5	40.0	24.5
Do.....	Pangkallahan R., Klumpang Bay.....	151749	Female, old....	335	385	85	64.7	40.5	25.2
Do.....	Klumpang Bay.....	154300	Male, old....	340	422	82	66.4	41.3	26.0
Do.....	do.....	154301	Male, adult....	336	410	82	65.8	42.3	27.0
Do.....	Pamukang Bay.....	151751	Female, adult....	315	415	85	63.4	39.7	24.0
Do.....	do.....	154298	Male, adult....	320	400	81	63.0	.....	24.6
Do.....	do.....	154299	.....do.....	325	395	81	64.7	40.0	24.8
Do.....	Sampanahan R., Pamukang Bay.....	151752	Female, young....	300	400	80	61.5	34.4	21.8
Do.....	do.....	151753	Female, adult....	345	420	85	66.3	41.7	27.0
Do.....	do.....	151754	Male, old....	338	420	86	67.0	37.8	27.0
Do.....	do.....	151755	Female, adult....	348	410	86	65.0	39.3	24.6
<i>R. vittata</i> ...	Saratok, Pulo Laut.....	151756	Male, adult....	355	425	86	.....	.....	27.0
Do.....	do.....	151757	.....do.....	370	425	89	66.8	41.0	27.0
Do.....	do.....	<sup>3</sup> 151758	Female, adult....	355	400	84	66.7	41.2	26.7
Do.....	do.....	151759	Male, old....	345	400	84	66.0	41.5	27.3
Do.....	do.....	151760	Male, adult....	345	390	84	66.0	41.4	27.0
<i>R. vittatula</i> ...	Pulo Sebuku.....	151761	.....do.....	340	385	80	63.2	41.0	27.0
Do.....	do.....	<sup>3</sup> 151762	Male, old....	333	395	80	62.8	41.6	27.0
Do.....	do.....	151763	Female, adult....	330	400	80	62.0	39.5	26.8
Do.....	do.....	151764	.....do.....	325	365	78	61.8	39.6	24.5
Do.....	do.....	151765	Male, adult....	343	360	81	62.7	40.0	26.3
Do.....	do.....	151766	Male, old....	338	380	80	62.5	39.0	24.0
Do.....	do.....	151767	Male, adult....	335	380	80	61.0	39.0	25.0

<sup>1</sup> Collector's measurements.

<sup>2</sup> Measured by writer after relaxing feet in water.

<sup>3</sup> Type.

*Specimens examined*.—Seven, all from Pulo Sebuku.

*Remarks*.—Superficially the two species, *R. vittata* and *R. vittatula*, appear identical, but the difference in size is absolutely constant, and there is no doubt as to their specific distinctness. The light coloring of the neck in *R. vittatula* is also constant. Both species are clearly offshoots from the mainland *R. ephippium*. The smallness of the Sebuku specimens was noticed by Doctor Abbott in the field.

NANNOSCIURUS EXILIS (Müller).

1907. *Nannosciurus exilis*, LYON, Proc. U. S. Nat. Mus., vol. 33, p. 558, December 24, 1907.

One specimen collected at Sanggau in 1905.

NANNOSCIURUS BORNEANUS Lyon.

1906. *Nannosciurus borneanus* LYON, Proc. Biol. Soc. Wash., vol. 19, p. 54, May 1, 1906.

1907. *Nannosciurus borneanus*, LYON, Proc. U. S. Nat. Mus., vol. 33, p. 558, December 24, 1907.

Fourteen additional specimens of this species of pigmy squirrel were secured, five from southeastern Borneo and nine from southwestern Borneo. They differ in no essential respects from the original series. (For measurements and exact localities see table below. Three specimens from Matan River and one immature individual from Tjantung, all in alcohol, are not included in the table.)

Measurements of pigmy squirrels.

Name.	Locality.	Catalogue No.	Sex and age.	Head and body. <sup>1</sup>	Tail vertebrae. <sup>1</sup>	Hind foot, with claws. <sup>2</sup>	Skull, gnathion to occipito-sphenoid suture.	Greatest breadth.	Interorbital constriction.
				mm.	mm.	mm.	mm.	mm.	mm.
<i>Nannosciurus borneanus</i> .	Pangkallahan River..	151793	Male, adult...	67	24	15.4	15.0	8.7	
Do.....	Saratok River.....	151794	.....do.....	83	62	23	15.5	15.7	10.2
Do.....	Klumpang Bay.....	151795	Female, adult.	85	70	24	15.6	15.8	10.8
Do.....	Upper Pasir River.....	<sup>3</sup> 154407	Male, adult...	75	52	21			
Do.....	Kendawangan River..	153682	.....do.....	85	60	25			
Do.....	Sempang River.....	145387	.....do.....	80	60	24	15.2	16.3	10.2
Do.....	.....do.....	145388	.....do.....	80	65	24	15.0	15.7	9.7
Do.....	Sungei Matan.....	145389	Female, adult.	87	63	26	16.0	16.4	10.3
Do.....	.....do.....	145390	Male, adult...	77	75	25	15.6	16.7	11.0
Do.....	.....do.....	145391	Female, adult.	80	60	24	16.8	16.4	10.0

<sup>1</sup>Collector's measurements.

<sup>2</sup>Measured by writer after relaxing feet in water.

<sup>3</sup>In alcohol.

## EPIMYS EPHIPIUM Jentink.

1880. *Mus ephippium* JENTINK, Notes Leyden Museum, vol. 2, p. 15.

1894. *Mus ephippium*, THOMAS, Ann. Mag. Nat. Hist., ser. 6, vol. 14, p. 453.

1907. *Mus ephippium*, LYON, Proc. U. S. Nat. Mus., vol. 33, p. 558, December 24, 1907.

In addition to the nine specimens of *Epimys ephippium* taken in western Borneo in 1905, Doctor Abbott secured twelve others, on later expeditions; two from Mount Palung, nine from Sempang River, one from Kendawangan River. None were taken in southeastern Borneo.

(For measurements see table below.)

Measurements of *Epimys ephippium*.

Name.	Locality.	Catalogue No.	Sex.	State of wear of teeth.	Head and body.	Tail.	Hind foot.	Greatest length of skull.	Zygomatic width.	Maxillary toothrow (alveoli).
<i>E. ephippium</i> ...	Gunong Palung	145553	Male....	Slightly worn...	mm. (1)	mm. (1)	mm. (1)	mm. 31.9	mm. 14.8	mm. 5.4
Do.....	do.	145555	Female...	do.	(1)	(1)	(1)	31.9	14.7	5.7
Do.....	Sempang River	145556	do.	do.	125	24	24	31.1	13.9	5.2
Do.....	do.	145557	do.	do.	130	127	24	31.1	14.8	5.2
Do.....	do.	145558	Male....	Unworn...	196	120	25			5.3
Do.....	do.	145559	Female...	do.	108	128	24	28.0		4.9
Do.....	do.	145560	do.	Slightly worn <sup>2</sup>	130	135	25	30.7		5.3
Do.....	do.	145561	do.	do.	127	140	25	31.8	14.0	5.3
Do.....	do.	145562	Male....	do. <sup>3</sup>	131	138	28	32.8	14.6	5.5
Do.....	do.	145563	Female...	do. <sup>4</sup>	140	136	26	31.6	14.8	5.6
Do.....	do.	145564	Male....	do. <sup>2</sup>	135	126	26	32.3	14.9	5.3
Do.....	Kendawangan River.	153720	Female...	do.	121	126	27			

<sup>1</sup> Skull only.

<sup>2</sup> Uterus contained 7 embryos.

<sup>3</sup> Scrotum very large.

<sup>4</sup> Mamme 2-2=8, evidently nursing.

## EPIMYS NEGLECTUS Jentink.

1880. *Epimys neglectus* JENTINK, Notes Leyden Museum, vol. 2, p. 14, January, 1880. Type-locality, Banjarmasin.

Doctor Abbott collected a large number of rats which may be referred to Jentink's *Epimys neglectus*. Most of them are from small islands lying off the coast of Borneo. Two only are from the mainland of Borneo and none were taken on the comparatively large Pulos Laut and Sebuku. As a whole the 83 specimens are fairly uniform in size, color, and cranial characters, after due allowance has been made for age. The dimensions of head and body, tail, and condylo-basal length of skull are increased as the animal advances toward old age. I have used the amount of wear of the check teeth for comparing ages. The measurements of hind foot and the alveoli of the maxillary tooth row are quite constant, irrespective of age. (See table of measurements, p. 101.) The great majority of the specimens are dark brownish in color but in nearly every island series certain of the skins tend to reddish brown. This is merely an individual characteristic and I am

unable to see that a series from one island differs as a whole from a series from another island. On the basis of measurements of the hind feet and the maxillary tooth row these rats may be separated into three groups: A group with small feet and small teeth characteristic of the specimens from the mainland and from the small and close-lying islands of Junata and Bauwal. These are here considered as typical *Epimys neglectus*. They agree closely with Jentink's measurements of the type. A group with small feet and large teeth, embracing the specimens from Pulos Panebangan, Lamukotan, and Mata Siri. A group with large feet and large teeth from Pulos Pelapis and Datu. Each of the last two groups are described below as subspecies of *Epimys neglectus*. They are not well marked forms and without a series of specimens it would be impossible to identify them, but they present average differences in size which can not be disregarded. It should be noted that the islands in geographic relation to each other, Pelapis and Panebangan, and Datu and Lamukotan are not in relation to each other so far as the forms of *neglectus* rats are concerned.

EPIMYS NEGLECTUS DUCIS, new subspecies.

*Type*.—Skin and skull of adult male, Cat. No. 145511, collected on Pulo Datu, off west coast of Borneo, May 4, 1907, by Dr. W. L. Abbott. Original number, 5174.

*Diagnostic characters*.—A form of *Epimys neglectus* Jentink characterized by longer hind feet and longer maxillary tooth row.

*Distribution*.—The islands of Pelapis and Datu off the west coast of Borneo.

*Color*.—Type: Upper parts and sides of head, neck and body, a mixture of blackish brown and a color between ochraceous buff and clay color, the blackish brown slightly in excess; under parts, cream buff, more or less dirty; outer sides of legs, similar to upper parts, inner sides, similar to under parts; tail light brownish; scantily haired, 3 brownish hairs to a scale, and each hair about the length of  $1\frac{1}{2}$  scales; outside of ears with short brownish hairs, inside with light dull buffy hairs.

*Pelage*.—Pelage of the back is composed of (1) rather long slender hairs, slaty at the base with a conspicuous ochraceous-buff-clay colored subterminal band, and a small dark brownish tip; (2) less numerous flattened, grooved bristles, somewhat spine-like, but not stiff enough for true spines, colored light grayish basally, and with a conspicuous brownish tip; (3) a few long slender bristles nearly twice the length of the grooved bristles, uniformly dark brownish in color.

*Skull and teeth*.—These are of the same general form and size as in the *alexandrinus-rattus* group of rats. The maxillary tooth row averages longer, from about 7 to 7.7 mm., than it does in typical *Mus neglectus*, about 6.5 to 7.



*Measurements.*—For external and cranial measurements of the type and series, see table, pages 101 and 102. The length of hind foot of this subspecies runs from 38 to 44 mm. nearly always over 40 mm., of the typical subspecies, 35 to 39, always under 40.

**EPIMYS NEGLECTUS LAMUCOTANUS, new subspecies.**

*Type.*—Skin and skull of adult female, Cat. No. 145497, collected on Pulo Lamukotan, off west coast of Borneo, May 10, 1907, by Dr. W. L. Abbott. Original number, 5224.

*Diagnostic characters.*—A form of *Epimys neglectus* Jentink, characterized by a longer maxillary tooth row.

*Distribution.*—The islands of Lamukotan and Panebangan, off the west coast of Borneo, and Pulo Mata Siri, off the southeast coast of Borneo.

*Color.*—Type: Upper parts and sides of head, neck, and body, a mixture in about equal proportions of blackish brown and a color between ochraceous buff and clay color; under parts, cream buff; outside of legs similar to upper parts; inner side similar to under parts; tail light brownish, scantily haired, three brownish hairs to each scale, and each hair about the length of one and one-half scales; outside of ears with short brownish hairs, inside with light dull buffy hairs.

*Pelage.*—As in *Epimys neglectus dueis* above.

*Skull and teeth.*—These are of the same general form and size as in the *alexandrinus-rattus* group of rats. The maxillary tooth row averages longer, from about 7 to 7.6 mm., than it does in typical *Epimys neglectus*, about 6.5 to 7.

*Measurements.*—For external and cranial measurements of the type and series, see table, page 101. The length of hind foot of this subspecies runs from 35 to 40 mm., nearly always under 40, about the same as in the typical subspecies.

*Remarks.*—The Mata Siri skins have on the average slightly longer hind feet than do skins from Panebangan and Lamukotan. Some of them have feet quite as large as do the members of the preceding subspecies, but they seem closest to the present form.

Measurements of *Epimys neglectus*.

Name.	Locality.	Catalogue No.	Sex.	State of wear of teeth.	Head and body. <sup>1</sup>	Tail. <sup>1</sup>	Hind foot. <sup>1</sup>	Condyle-basal length.	Zygomatic width.	Maxillary tooththrow (alveoli).
<i>E. neglectus neglectus</i> .	Sempang River.	145569	Male	.....	mm. 154	mm. ....	mm. 36	mm. ....	mm. ....	mm. ....
Do.....	do.....	145570	Female	Slightly worn...	160	173	35	35.9	18.0	6.5
Do.....	Pulo Junata....	145442	Male	Moderately worn.	195	192	37	40.6	20.4	6.7
Do.....	do.....	145443	do.....	Much worn.....	195	182	37	40.5	19.9	6.7
Do.....	do.....	145444	do.....	Slightly worn...	162	178	35	37.5	18.4	6.3
Do.....	do.....	145445	do.....	Much worn.....	193	184	37	40.2	19.4	6.5
Do.....	do.....	145446	do.....	do.....	194	185	37	40.7	19.7	6.7
Do.....	do.....	145447	do.....	do.....	198	193	39	41.5	19.6	6.8
Do.....	do.....	145448	Female	Moderately worn.	202	203	39	41.6	20.1	7.1
Do.....	do.....	145449	do.....	Much worn.....	198	193	39	42.3	20.2	6.7
Do.....	Pulo Bauwal....	153731	Male	Moderately worn.	176	205	39	.....	19.0	6.8
Do.....	do.....	153732	do.....	do.....	190	216	40	39.9	20.4	6.9
Do.....	do.....	153734	do.....	Slightly worn...	166	190	38	36.3	18.4	6.8
Do.....	do.....	153733	Female	do.....	153	195	39	35.8	17.9	6.9
Do.....	do.....	153735	do.....	Moderately worn.	181	212	39	39.5	20.0	6.7
Do.....	do.....	153736	do.....	Slightly worn...	175	213	39	37.5	18.3	7.2
<i>E. neglectus lamucolatus</i> .	Pula Mata Siri ..	2151943	Male	Moderately worn.	177	.....	38	37.9	18.7	7.3
Do.....	do.....	151946	do.....	do.....	182	171	38	37.9	19.5	7.2
Do.....	do.....	151947	do.....	do.....	183	183	38	38.2	20.2	7.4
Do.....	do.....	151948	do.....	do.....	177	189	39	39.0	19.7	7.6
Do.....	do.....	151951	do.....	do.....	184	192	38	39.6	20.5	7.2
Do.....	do.....	2151953	do.....	do.....	196	215	41	41.7	21.4	7.3
Do.....	do.....	2151955	do.....	do.....	192	204	41	40.8	20.4	7.3
Do.....	do.....	2151956	do.....	Much worn.....	193	190	39	40.3	20.5	7.5
Do.....	do.....	151958	do.....	Moderately worn.	199	190	40	41.5	21.2	7.5
Do.....	do.....	151959	do.....	do.....	199	.....	41	41.8	20.8	7.4
Do.....	do.....	151960	do.....	do.....	194	166	39	39.7	20.6	7.3
Do.....	do.....	2151944	Female	do.....	185	185	39	39.8	20.5	7.3
Do.....	do.....	2151945	do.....	do.....	184	186	39	40.0	19.8	7.4
Do.....	do.....	151949	do.....	do.....	194	196	39	.....	.....	7.4
Do.....	do.....	151950	do.....	do.....	190	182	37	38.7	20.7	7.5
Do.....	do.....	2151952	do.....	Much worn.....	.....	.....	.....	41.4	21.5	7.3
Do.....	do.....	2151954	do.....	Moderately worn.	177	183	38	37.5	.....	7.2
Do.....	do.....	151957	do.....	Much worn.....	199	207	41	43.2	22.5	7.3
Do.....	do.....	151961	do.....	do.....	200	187	40	41.9	22.3	7.2
Do.....	Pulo Lamukotan.	145485	Male	Slightly worn...	184	181	37	39.7	19.7	7.2
Do.....	do.....	145486	do.....	do.....	187	185	38	38.7	19.4	7.1
Do.....	do.....	145487	do.....	do.....	172	173	38	37.4	18.0	7.2
Do.....	do.....	145488	do.....	do.....	186	181	39	39.5	18.9	7.0
Do.....	do.....	145489	do.....	do.....	168	173	39	36.8	18.8	7.2
Do.....	do.....	145490	do.....	do.....	180	189	38	37.6	18.7	7.4
Do.....	do.....	145491	do.....	Much worn.....	201	179	39	41.5	20.6	7.4
Do.....	do.....	145492	do.....	Slightly worn...	156	164	38	35.5	17.5	7.1
Do.....	do.....	145493	do.....	do.....	158	147	37	35.7	18.4	7.2
Do.....	do.....	145494	do.....	do.....	158	167	37	.....	17.7	7.2
Do.....	do.....	145495	Female	do.....	185	177	37	.....	.....	7.2
Do.....	do.....	145496	do.....	Moderately worn.	194	185	36	39.3	20.0	7.3
Do.....	do.....	2145497	do.....	do.....	180	178	38	39.6	20.0	7.6
Do.....	Pulo Panebangan.	145544	Male	Moderately worn.	178	175	37	38.0	19.1	7.3
Do.....	do.....	145545	do.....	do.....	169	168	35	37.2	18.3	7.1
Do.....	do.....	145547	do.....	do.....	180	182	36	38.4	.....	7.1
Do.....	do.....	145546	Female	Slightly worn...	145	160	36	34.4	18.2	7.6
Do.....	do.....	145548	do.....	Moderately worn.	181	.....	37	40.0	20.5	7.5
Do.....	do.....	2145550	Male	Much worn.....	188	.....	37	.....	19.6	6.8
Do.....	do.....	2145551	do.....	Moderately worn.	177	154	35	37.4	19.5	7.4
Do.....	do.....	2145552	do.....	do.....	173	166	.....	37.3	19.3	6.9
Do.....	do.....	2145549	Female	Much worn.....	184	186	37	39.5	21.2	7.3
<i>E. neglectus ducis</i> .	Pulo Datu.....	145507	Male	do.....	206	202	43	42.7	.....	7.7

<sup>1</sup> Collector's measurements.<sup>2</sup> Skull only, but specimen measured in flesh by collector.<sup>3</sup> Type.

Measurements of *Epimys neglectus*—Continued.

Name.	Locality.	Catalogue No.	Sex.	State of wear of teeth.	Head and body.	Tail.	Hind foot.	Condylar length.	Zygomatic width.	Maxillary tooththrow (alveoli).
<i>E. neglectus</i>	Pulo Datu.....	145508	Male....	Moderately worn.	mm. 206	mm. 183	mm. 42	mm. 41.3	mm. 18.8	mm. 7.3
<i>ducis.</i>	Do.....	145509	do.....	Much worn.....	209	202	41	42.3	20.5	6.9
Do.....	do.....	145510	do.....	Moderately worn.	210	206	43	41.7	19.6	7.7
Do.....	do.....	<sup>1</sup> 145511	do.....	do.....	200	194	40	40.4	19.8	7.6
Do.....	do.....	145512	do.....	do.....	208	195	42	40.7	19.6	7.4
Do.....	do.....	145513	Female	Much worn.....	199	198	42	41.5	19.8	7.2
Do.....	do.....	145514	do.....	do.....	212	198	42	43.6	19.9	6.9
Do.....	do.....	145515	do.....	do.....	216	216	44	43.1	21.4	7.6
Do.....	do.....	145516	do.....	do.....	210	182	41	42.5	21.0	7.2
Do.....	do.....	145517	do.....	do.....	207	195	41	42.7	20.3	7.4
Do.....	Pulo Pelapis.....	145450	Male....	Moderately worn.	212	222	41	42.7	21.5	7.3
Do.....	do.....	145451	do.....	Much worn.....	207	208	40	42.3	21.9	7.8
Do.....	do.....	145452	do.....	do.....	208	220	41	41.9	20.5	7.5
Do.....	do.....	145455	do.....	Moderately worn.	210	207	41	41.9	20.5	7.6
Do.....	do.....	145458	do.....	Much worn.....	214	187	41	42.4	21.8	7.4
Do.....	do.....	145459	do.....	do.....	207	204	40	41.1	20.5	6.9
Do.....	do.....	145460	do.....	Moderately worn.	202	174	40	41.1	20.5	7.3
Do.....	do.....	145453	Female	do.....	208	220	40	41.7	22.0	7.3
Do.....	do.....	145454	do.....	do.....	197	213	40	41.6	20.5	7.5
Do.....	do.....	145456	do.....	do.....	190	200	40	40.9	20.8	7.2
Do.....	do.....	145457	do.....	do.....	215	220	41	42.5	22.0	7.5
Do.....	do.....	<sup>2</sup> 145461	Male....	do.....	194	204	38	39.0	19.3	7.4
Do.....	do.....	<sup>2</sup> 145462	do.....	do.....	194	200	38	39.3	19.7	7.2
No.....	do.....	<sup>2</sup> 145463	Female	do.....	195	200	41	39.8	20.0	7.3
Do.....	do.....	<sup>2</sup> 145464	do.....	do.....	197	193	39	39.8	19.8	7.4

<sup>1</sup> Type.<sup>2</sup> Skull only, but specimen measured in flesh by collector.

## EPIMYS SEBUCUS, new species.

*Type*.—Skin and skull of adult male, Cat. No. 151964, collected on Pulo Sebuku, off southeastern coast of Borneo January 2, 1908, by Dr. W. L. Abbott. Original number, 5717.

*Diagnostic characters*.—A member of the *Epimys firmus*<sup>3</sup> group, differing from the typical form in a more reddish brown general coloration.

*Color*.—Type: Upper parts and sides of head, neck, and body and outer sides of legs a coarse grizzly mixture of blackish and a color something between russet and tawny olive, the russet more conspicuous posteriorly; under parts and inner sides of legs, buff or buffy, the hairs practically the same color to their bases; tail uniformly brownish throughout; feet similar, ears dark brownish, very scantily haired with short dark hairs.

*Pelage*.—Pelage of three kinds of hairs, short, uniformly grayish colored under fur; longer hairs with dark bases, a russet-tawny olive middle portion and blackish tips; and long, slender grooved bristles, uniformly blackish in color; the three types named in the order of their abundance. Middle portion of tail with ten scales to the cen-

<sup>3</sup> Miller, Proc. Acad. Nat. Sci. Phila., 1902, p. 155, June 11, 1902.

timeter, each scale subtended by three hairs, equalling a scale or a scale and a quarter in length.

*Skull and teeth.*—These show no special characters, and I can find no essential differences to distinguish them from the skulls and teeth of *Epimys firmus*.

*Measurements.*—For measurements of the type and series see table, page 104.

*Specimens examined.*—Eleven, all from Pulo Sebuku.

*Remarks.*—*Epimys sebuscus* at best can only be considered a slightly differentiated form of the widely distributed *Epimys firmus* group, of which there are many examples in the museum from Sumatra and adjacent islands and the Rhio-Linga Archipelago. No members of the group were taken on Borneo.

EPIMYS CRASSUS, new species.

*Type.*—Skin and skull of adult male, Cat, No. 145471, collected on Pulo Lamukotan, off the west coast of Borneo, May 8, 1907, by Dr. W. L. Abbott. Original number, 5190.

*Diagnostic characters.*—A large member of the *Epimys firmus*<sup>1</sup> group, differing from the typical form in larger size, larger and heavier skull, and a rather prominent swelling on the anterior portion of the nasal bones.

*Color.*—Type: Upper parts and sides of head, neck, and body, and outer sides of legs a coarse grizzly mixture of blackish and buff, slightly darker and rather duller than that of Ridgway; under parts and inner sides of legs cream color, the hairs essentially the same color throughout; tail and feet light brownish; ears dark brownish, very scantily covered with short, dark hairs.

*Pelage.*—Pelage of three kinds of hairs; short, uniformly grayish colored under fur; longer hairs with dark bases, a buffy middle portion, and blackish tips; and long, slender grooved bristles, blackish in color; the three types named in the order of their abundance. Middle portion of tail with eight and one-half scales to the centimeter, each scale subtended by three hairs, equally about a scale and a quarter in length.

*Skull and teeth.*—The skulls of *Epimys crassus* average larger and heavier than do those of *E. firmus* of like age, and most of the specimens have an elongated swelling on the outer side of the anterior half of the nasal bones, which is barely indicated on the skulls of other members of the *firmus* group. The teeth average slightly smaller than they do in *Epimys sebuscus*. The bullæ, also, are a trifle smaller in *E. crassus*.

*Measurements.*—For measurements of the type and series see table, page 104.

*Specimens examined.*—Fourteen, from Pulo Lamukotan.

<sup>1</sup> Miller, Proc. Acad. Nat. Sci. Phila., 1902, p. 155, June 11, 1902.



*Remarks.*—*Epimys crassus* appears to be a well-defined member of the *E. firmus* group. It is larger than any other members of the group in the U. S. National Museum. The swelling of the nasals is also quite characteristic. Externally it can not be differentiated from typical *firmus*.

*Measurements of rats of the firmus group.*

Name.	Locality.	Catalogue No.	Sex.	State of wear of teeth.	Head and body. <sup>1</sup>	Tail. <sup>1</sup>	Hind foot. <sup>1</sup>	Condylar-basal length.	Zygomatic width.	Maxillary tooththrow (alveoli).
<i>Epimys crassus</i> .	Pulo Lamukotan.	<sup>2</sup> 145471	Male....	Moderately worn	mm. 255	mm. 260	mm. 50	mm. 54.2	mm. 27.7	mm. 8.8
Do.....	do.....	145472	do.....	do.....	259	291	51	55.3	28.8	9.0
Do.....	do.....	145473	do.....	Much worn.....	255	277	50	52.3	26.7	8.6
Do.....	do.....	145474	Female.....	do.....	249	275	49	50.5	26.5	8.6
Do.....	do.....	145475	do.....	Moderately worn	210	239	47	.....	.....	8.6
Do.....	do.....	145476	Male.....	Slightly worn.....	215	225	47	.....	.....	8.5
Do.....	do.....	145477	do.....	Moderately worn	240	262	49	50.5	26.3	8.8
Do.....	do.....	145478	do.....	do.....	232	258	49	50.0	24.5	8.7
Do.....	do.....	145479	Female.....	do.....	225	240	47	47.7	23.3	8.8
Do.....	do.....	145480	Male.....	do.....	227	239	50	47.9	24.6	8.9
Do.....	do.....	145481	do.....	do.....	241	279	53	49.6	24.5	8.7
Do.....	do.....	145482	do.....	do.....	.....	.....	48	48.2	24.9	8.9
Do.....	do.....	145483	Female.....	do.....	222	219	47	46.2	24.3	8.8
Do.....	do.....	145484	do.....	Much worn.....	242	255	49	52.9	26.2	8.5
<i>Epimys scbucus</i>	Pulo Sebuku.	<sup>2</sup> 151961	Male.....	do.....	263	267	50	51.2	27.7	9.7
Do.....	do.....	151963	Female.....	do.....	254	255	46	48.8	25.7	9.3
Do.....	do.....	<sup>2</sup> 151964	Male.....	Moderately worn	251	277	51	49.6	26.4	9.8
Do.....	do.....	151965	Female.....	do.....	225	242	46	48.0	25.3	9.4
Do.....	do.....	151966	Male.....	Much worn.....	241	.....	51	50.5	27.5	9.6
Do.....	do.....	151967	do.....	Slightly worn.....	216	224	46	45.7	23.0	9.1
Do.....	do.....	151968	Female.....	Much worn.....	237	238	48	49.5	27.2	9.5
Do.....	do.....	151969	do.....	do.....	234	234	46	48.9	25.0	9.0
Do.....	do.....	151970	Male.....	Unworn.....	192	210	46	40.8	21.6	8.9
Do.....	do.....	151971	do.....	Much worn.....	247	233	46	49.9	26.7	9.1
Do.....	do.....	151972	Female.....	Moderately worn	230	250	46	48.2	24.9	9.4

<sup>1</sup> Collector's measurements.

<sup>2</sup> Type.

EPIMYS SABANUS Thomas.

1887. *Mus sabanus* THOMAS, Ann. Mag. Nat. Hist., ser. 5, vol. 20, p. 269, 1887.

Six specimens from the mainland of Borneo, a fully adult female from the foot of Mount Palung, a young adult female from the Saratok River, and four young adult females from Balik Papan Bay, and a young adult female from Pulo Laut. The fully adult specimen agrees in all essential respects with an example from northern Borneo. The younger specimens, however, are distinctly smaller, more so than their age would indicate. It is possible that they represent another form of the *Epimys sabanus* group, but the material at hand is too scanty to determine this.

(For measurements see table, p. 106.)

EPIMYS NASUTUS, new species.

*Type.*—Skin and skull of adult male, Cat. No. 145519, collected on Pulo Panebangan, off west coast of Borneo, May 21, 1907, by Dr. W. L. Abbott. Original number, 5270.

*Diagnostic characters.*—A member of the *Epimys sabanus*<sup>1</sup> group characterized by a shorter tail, somewhat smaller skull, and distinctly heavier rostrum.

*Color.*—Type: Upper parts and sides of head, neck, and body and outer sides of legs a mixture of blackish and orange buff, the former in excess in the median line, and the latter in excess along the sides and on the legs; underparts, including inner sides of legs, cream color, lighter on the throat than elsewhere; ears dark brownish, scantily clothed with a few dark hairs; tail brownish, not noticeably lighter below than above.

*Pelage.*—Pelage composed of three kinds of hairs—a rather scanty, dull, drab-gray colored underfur; hairs of normal texture, with dull grayish bases, succeeded by a dark brownish ring, then the conspicuous orange buff band and a small blackish apex; flattened and grooved spines, dull grayish at base and blackish at extremity. On the underparts the spinous hairs are shorter and weaker, and all the hairs are uniformly cream color throughout. Middle portion of tail with seven and one-half scales to the centimeter, each scale subtended by three hairs about a scale and a half in length.

*Skull and teeth.*—The skull and teeth are about the average in size for the group, but the skull is angular and massive; the brain case and interorbital region being wider than usual, and the rostrum unusually heavy.

*Measurements.*—Type: Head and body, 252 (253)<sup>2</sup> mm.; tail, 326 (329); hind foot, 54 (49); condylo-basal length of skull, 51.4 (51.7); zygomatic width, 25.8 (26.2); interorbital constriction, 9.3 (9.4); breadth of brain case above roots of zygomata 19.4 (19.4); greatest breadth of rostrum, 11 (10.6); depth of rostrum near incisors, 11.3 (11.5); maxillary tooth row, alveoli, 9.3 (9.3). (See table, p. 106.)

*Specimens examined.*—Three, all from Pulo Panebangan, two skins with skulls and one skull without skin.

*Remarks.*—*Epimys nasutus* differs by its heavy rostrum from all the rats of the *E. sabanus* group that I have seen with the exception of *E. balæ* from Tana Bala of the Batu Islands, off the west coast of Borneo. The skull of the Panebangan animal is decidedly larger, however, than that of the rat from Tana Bala. The tail of the latter is rather short and uniformly brownish in color, like the tail of *Epimys nasutus*. The tails of about half the members of the group are distinctly bicolor, brownish above and cream color beneath.

<sup>1</sup> Thomas, Ann. Mag. Nat. Hist., ser. 5, vol. 20, p. 269, 1887.

<sup>2</sup> Measurements in parentheses are those of a paratype, Cat. No. 145518, an old adult female.

## Measurements of long-tailed rats.

Name.	Locality.	Catalogue No.	Sex.	State of wear of teeth.	Head and body. <sup>1</sup>	Tail. <sup>1</sup>	Hind foot. <sup>1</sup>	Condylar-basal length.	Zygomatic width.	Maxillary tooththrow (al. veol).
<i>Epimys sabanus</i> .	Base of Mount Palung.	145565	Female.	Much worn.	mm. 263	mm. 382	mm. 50	mm. 53.5	mm. 24.4	mm. 10.0
Do.	Saratok River.	151942	do.	Moderately worn	230	328	49	48.3	22.5	10.1
Do.	Pulo Laut.	151917	do.	do.	210	290	44	45.8	23.0	9.4
Do.	Balik Papan Bay	154306	do.	do.	247	370	50	51.5	24.9	10.5
Do.	do.	154307	do.	do.	244	346	50	51.7	25.6	10.8
Do.	do.	154308	do.	do.	231	354	47	49.2	24.7	9.8
Do.	do.	<sup>2</sup> 154309	do.	do.	240	355	48	50.7	25.0	10.0
<i>Epimys nasutus</i> .	Pulo Panebangan.	145518	do.	Much worn.	253	329	49	51.7	26.2	9.3
Do.	do.	<sup>2</sup> 145519	Male.	Moderately worn	252	326	54	51.4	25.8	9.3
Do.	do.	<sup>3</sup> 145520	Female.	Slightly worn.	188	272	46	.....	.....	9.3

## EPIMYS WHITEHEADI (Thomas).

1894. *Mus whiteheadi* THOMAS, Ann. Mag. Nat. Hist., ser. 6, vol. 14, p. 457, December, 1894.

About fifty specimens of small reddish brown, spiny rats, with bicolor tails, were collected in various parts of Borneo or on islands near the coast by Doctor Abbott. (For the exact localities see table of measurements, p. 107.) I have called them all *Epimys whiteheadi*, although they show much variation, and I have been unable to compare them with topotypes from northern Borneo. Several of the present series have a strong tendency to be more brown and less "red" on the upper parts and to have gray instead of ochraceous bellies. Such specimens also average larger externally and cranially than do the others. These specimens are perhaps representatives of Thomas's recently described *Epimys whiteheadi perlutus*,<sup>4</sup> but they have distinctly smaller skulls, shorter tails, and longer hindfeet, and are found in southwestern Borneo and Pulos Bauwal and Sebuksu. The series of skins from Balik Papan Bay are very uniform in their bright "reddish" coloration and look exactly like a series of topotypes of *Epimys asper* (Miller)<sup>5</sup> from Trong, Lower Siam.

(For measurements see table, p. 107.)

<sup>1</sup> Collector's measurements.

<sup>2</sup> Type.

<sup>3</sup> Skull only.

<sup>4</sup> Ann. Mag. Nat. Hist., ser. 8, vol. 7, p. 205, February, 1911.

<sup>5</sup> Proc. Biol. Soc. Wash., vol. 13, p. 145, April 21, 1900.

Measurements of *Epimys whiteheadi*.

Locality.	Catalogue No.	Sex.	State of wear of teeth.	Head and body. <sup>1</sup>	Tail. <sup>1</sup>	Hind foot. <sup>1</sup>	Greatest length of skull.	Zygomatic width.	Maxillary toothrow (alveoli).
				mm.	mm.	mm.	mm.	mm.	mm.
Summit of Mount Palang.	145553	Male.		130	108	32			
Do.	145554	Female.	Moderately worn.	133	125	33	34.0	15.6	6.2
Do.	<sup>2</sup> 145555	do.		128	102	30			
Kendawangen River.	155720	do.	Unworn.				30.0	14.0	5.2
Do.	155721		Slightly worn.		90			13.0	5.2
Do.	155722	Female.	Moderately worn.	129	105	28	30.4	14.0	5.2
Do.	155723	do.	Much worn.	131		26	32.2	14.5	4.9
Do.	155724	do.	Moderately worn.	139		32		15.6	5.7
Do.	<sup>2</sup> 155725	Male.	do.	120	115	31	31.5	14.0	5.7
Do.	155726	Female.	do.	111	101	27	30.5	14.0	5.4
Do.	<sup>2</sup> 155727	Male.	do.	129	127	33	33.0	15.3	5.9
Do.	<sup>2</sup> 155728	Female.	do.	113		32		14.6	5.9
Do.	155729	Male.	do.	125	108	30			5.4
Do.	155730	Female.	do.	112	95	28	29.7		5.3
Pulo Bauwal.	153710	do.	do.	114	104	29	31.2	14.4	5.6
Do.	153711	do.	Slightly worn.	118	102	30	30.0	14.4	5.4
Do.	153712		do.				31.0	14.3	5.7
Do.	153713	Female.	Moderately worn.	125	108	30	30.7	14.7	5.4
Do.	153714	do.	do.	120	102	31	31.4	14.0	5.5
Do.	153715	do.	do.	125	98		30.9		5.5
Do.	153716	do.	Slightly worn.	113		28	28.7		5.5
Do.	153717	do.	Moderately worn.	117		28	30.8	14.8	5.3
Do.	153718	Male.	Much worn.	146	130	32	34.0	15.4	5.4
Do.	153719	Female.	Moderately worn.				30.4	14.4	5.4
Pulo Sebuksu.	151933								5.8
Do.	151934	Male.	Slightly worn.	136	88	30			5.7
Do.	151937	do.	Moderately worn.	133	94	28	32.7	15.0	5.7
Do.	do.	do.		135	105	29	34.0	15.4	5.9
Do.	151938								5.6
Do.	151939	Female.	Slightly worn.	130	93	27	31.4	15.0	5.6
Do.	151940	do.	Moderately worn.	130	88	27		14.2	5.7
Do.	<sup>3</sup> 151941	Male.	do.	128		28	31.8	14.8	5.7
Do.	151941	do.	do.				30.6	14.8	5.3
Balik Papan Bay.	154321	Female.	do.				31.5	14.6	5.2
Do.	154322	Male.	do.	117	105	27			
Do.	154323	do.		125	103	29			5.6
Do.	154324	do.	Moderately worn.	112	98	29	31.5	14.5	5.8
Do.	154325	do.	do.	118	100	28			5.2
Do.	154326	Female.	do.	120	99	27		14.5	5.2
Do.	154327	Male.	do.	128	118	30	33.0	14.7	5.5
Do.	154328	Female.	do.	113	102	29	30.6	14.2	5.3
Do.	154329	do.	do.	122		28	31.6	14.9	5.6
Do.	154330	Male.	do.	122	98		31.0	14.7	5.3
Do.	154331	do.	do.	134	109	29	32.4	14.2	5.4
Do.	154332	Female.	do.	115	92	25	31.0	14.3	5.6
Do.	154333	Male.	do.	122	105	29	32.0	14.2	5.2
Do.	154335	Female.	do.	119	94	28	33.1	14.0	5.8
Do.	154336			128	104	28	31.3		5.4
Do.	154337	Male.	Moderately worn.	117	95				5.2
Do.	154338	Female.	do.	125	103	29	31.3	14.0	5.6

<sup>1</sup> Collector's measurements.<sup>2</sup> Belly gray.<sup>3</sup> Uterus contained two embryos.

## EPIMYS RAJAH Thomas.

1894. *Mus rajah* THOMAS, Ann. Mag. Nat. Hist., ser. 6, vol. 14, p. 451, December, 1894.

About ninety specimens of rats belonging to the *Epimys rajah* group were collected on Borneo and many of the adjacent islands. About half of them, embracing all those from the mainland of Borneo, and from Pulos Lamukotan, Datu, and Bauwal, may be regarded as representing the typical form. Those from the other islands are referred to four different forms, three of which are described below as new. The specimens from southeastern Borneo average brighter



in color than do those from the western part of the island, in this respect resembling the form occurring on Pulo Laut.

(For measurements and localities, see table, pp. 110 and 111.)

#### EPIMYS SERUTUS.

1906. *Mus serutus* MILLER, Proc. U. S. Nat. Mus., vol. 31, p. 59, July 23, 1906.

Twelve specimens collected on Pulo Serutu, Karimata Islands.

#### EPIMYS CARIMATÆ MILLER.

1906. *Mus carimatæ* MILLER, Proc. U. S. Nat. Mus., vol. 31, p. 59, July 23, 1906.

Type-locality, Karimata Island.

Six rats of the *Epimys rajah-surifer* group collected on Pulo Pelapis do not show any material differences from *Epimys carimatæ*. There are more specimens inclined to be dark in the Pelapis series than in the Karimata series, but none of them are darker than the darkest of those from Karimata. Eleven specimens were collected on Karimata in 1904.

(For measurements, see table, p. 110.)

#### EPIMYS PERFLAVUS, new species.

*Type*.—Skin and skull of adult male, Cat. No. 151918, collected on Pulo Laut, off southeast coast of Borneo, December 25, 1907, by Dr. W. L. Abbott. Original number, 5684.

*Diagnostic characters*.—A member of the *Epimys rajah-surifer* group with the upper parts and sides strongly colored with bright ochraceous buff.

*Color*.—Type: Upper parts and sides of head, neck, and body and outer sides of legs bright ochraceous buff, sparingly mixed with light brownish along the middle of the back; under parts whitish to cream color, this color extending part way down the inner side of the legs; an indication of an ochraceous buff collar on throat (present in five of the paratypes and absent in three); feet whitish; upper surface of tail dark, under surface whitish; ears dark brownish, scantily clothed with dark hairs.

*Skull and teeth*.—These show no tangible differences from the skulls and teeth of *Epimys rajah*.

*Measurements*.—See table, pages 110 and 111.

*Specimens examined*.—Eleven skins with skulls and two skulls without skins, all from Pulo Laut.

*Remarks*.—*Epimys anambæ* Miller<sup>1</sup> shows the nearest approach in coloration to *E. perflavus*, but the upper parts in the Anamba rats are considerably darkened by brownish, and the external measurements are not so large. *Epimys anambæ* also appears to have a smaller skull, with a relatively shorter rostrum. The skulls of Malayan rats change

<sup>1</sup> Proc. Wash. Acad. Sci., vol. 2, p. 205, August 20, 1900.

so much in shape and size with increasing age and present so many apparent individual variations that not very much reliance can be placed upon them as determining species.

EPIMYS SATURATUS, new species.

*Type*.—Skin and skull of adult male, Cat. No. 145523, collected on Pulo Panebangan, off west coast of Borneo, May 17, 1907, by Dr. W. L. Abbott. Original number, 5236.

*Diagnostic characters*.—A medium sized member of the *Epimys rajah-surifer* group of rats, distinguished by its dark orange-buff and blackish coloration.

*Color*.—Type: Upper parts of head, neck, and body a mixture of orange-buff, rather darker than Ridgway's, and blackish, the latter color in excess along the back; sides of head, neck, and nearly all of legs nearly clear orange-buff, only sparingly mixed with blackish; under parts whitish to cream color, extending part way down inner side of legs; an orange-buff collar, 10 to 15 mm. wide, between throat and chest; feet whitish; ears blackish; tail dark above, cream color below.

*Skull and teeth*.—The skull and teeth of *Epimys saturatus* do not appear to differ from those of the related *Epimys rajah* and *E. carimata*.

*Measurements*.—See table, page 111.

*Specimens examined*.—Twenty-three, six skins with skulls and seventeen skulls with no skins, all from Pulo Panebangan.

*Remarks*.—*Epimys saturatus* is one of the darkest and richest colored members of the *E. rajah* group. Other species are as dark, such as the near-by *Epimys serutus* from Pulo Serutu of the Karimata Islands, but the darker color is produced by an increase in the blackish elements, while in *E. saturatus* the lighter colors are deepened.

EPIMYS UBECUS, new species.

*Type*.—Skin and skull of adult male, Cat. No. 151931, collected on Pulo Sebuku, off southeast coast of Borneo, January 3, 1908, by Dr. W. L. Abbott. Original number, 5727.

*Diagnostic characters*.—A member of the *Epimys rajah* group, generally resembling *rajah*, but distinctly smaller.

*Color*.—Type: Upper parts of head, neck, and body a mixture of dark brownish and ochraceous buff, the darker color more prominent in the middle area of the back; sides of head, neck, and body, and outer sides of legs, ochraceous buff, nearly clear but slightly mixed with brownish; under parts and inner sides of legs whitish to cream color, the light color not interrupted at the throat by a darker collar; feet whitish; tail dark above, whitish beneath and at the extremity.

*Skull and teeth.*—These have the same general shape and proportions found in *Epimys rajah*, but are distinctly smaller throughout.

*Measurements.*—See table, page 111.

*Specimens examined.*—Three skins with skulls and one skull without skin, all from Pulo Sebuku.

*Measurements of rats of the Epimys rajah group.*

Name.	Locality.	Catalogue No.	Sex.	State of wear of teeth.	Head and body.	Tail.	Hind foot.	Condylo-basal length of skull.	Zygomatic width.	Maxillary toothrow (alveoli).
					mm.	mm.	mm.	mm.	mm.	mm.
<i>E. rajah</i> .....	Base of Mount Palung.	145566	Female	Moderately worn	202	198	42	41.3	19.6	6.9
Do.....	Matan River	145567	do	do	200	206	44	42.6	19.7	6.8
Do.....	do	145568	do	Much worn	198	178	40	39.9	18.8	6.5
Do.....	Batu-Jurong	153701	do	Moderately worn	176	185	41	38.5	18.1	6.7
Do.....	do	153702	Male	do	185	185	42	38.4	18.4	6.5
Do.....	do	153703	do	Slightly worn	183	185	41	38.5	18.4	6.3
Do.....	do	153704	Female	Moderately worn	175	185	41	38.0	18.8	6.2
Do.....	Kendawangan River.	153705	do	Slightly worn	167	180	45	37.4	19.6	6.4
Do.....	do	153706	Male	do	167	174	41	35.8	17.8	6.2
Do.....	do	153707	do	Moderately worn	178	194	42	40.5	18.7	6.5
Do.....	Klumpang Bay.	151932	Female	do	189	181	39	38.6	18.4	6.4
Do.....	Pasir River	154310	Male	do	184	170	39	40.4	19.5	6.4
Do.....	Balik Papan Bay	154311	Female	do	181	194	40	38.5	19.6	6.4
Do.....	do	154312	Male	Moderately worn	162	177	38	36.7	18.8	6.6
Do.....	do	154313	do	do	192	178	38	35.4	18.8	6.6
Do.....	do	154314	do	do	165	190	40	36.0	16.9	5.9
Do.....	do	154315	Female	do	208	198	39	40.5	20.7	7.0
Do.....	Pamukang Bay.	154316	Male	do	173	192	39	38.0	19.2	6.3
Do.....	Balik Papan Bay.	154317	do	Slightly worn	178	172	40	37.8	19.2	6.6
Do.....	do	154318	do	do	198	198	37	42.0	19.6	7.1
Do.....	do	154319	do	Much worn	198	208	38	42.9	20.6	6.7
Do.....	do	154320	Female	do	196	208	38	42.9	20.6	6.7
Do.....	Pulo Lamukotan.	145498	Male	Unworn	137	173	33	33.3	15.3	6.0
Do.....	Pulo Datu	145501	do	do	224	212	44	44.8	21.2	6.8
Do.....	do	145502	do	Moderately worn	200	202	44	41.7	19.8	6.6
Do.....	do	145503	Female	do	180	178	40	39.9	19.0	6.5
Do.....	do	145504	do	do	194	181	40	39.7	18.9	6.7
Do.....	do	145505	do	Much worn	214	189	41	40.5	19.4	6.8
Do.....	do	145506	Male	Moderately worn	193	188	43	42.7	19.4	6.8
Do.....	Pulo Bauwal.	153685	do	do	198	188	41	40.5	19.4	6.8
Do.....	do	153686	do	Slightly worn	176	168	42	37.0	17.5	6.3
Do.....	do	153687	Female	Moderately worn	195	176	40	39.2	19.0	6.6
Do.....	do	153688	do	Slightly worn	172	128	44	37.3	17.5	6.4
Do.....	do	153689	Male	do	168	162	41	36.2	17.8	6.4
Do.....	do	153690	Female	Much worn	190	172	41	40.6	17.5	6.3
Do.....	do	153691	do	Slightly worn	182	166	42	37.0	17.6	6.2
Do.....	do	153692	do	do	164	157	41	36.6	17.3	6.6
Do.....	do	153693	do	do	168	165	40	36.2	18.0	6.7
Do.....	do	153694	Male	do	182	174	44	37.8	18.5	6.4
Do.....	do	153695	Female	Moderately worn	188	177	40	39.1	17.5	6.6
Do.....	do	153696	do	do	179	161	40	36.6	17.5	6.6
Do.....	do	153697	do	Slightly worn	170	165	41	36.6	17.5	6.6
Do.....	do	153698	do	Much worn	210	188	41	41.8	19.8	6.9
Do.....	do	153699	Male	do	209	188	42	40.6	17.6	6.7
Do.....	do	153700	Female	Slightly worn	171	162	40	36.8	17.9	6.2
Do.....	do	153708	Male	do	180	173	42	37.0	17.9	6.2
<i>E. carinate</i> .....	Pulo Pelapis	145465	Female	Much worn	215	167	41	42.8	20.9	6.7
Do.....	do	145466	Male	do	212	158	43	43.6	20.9	6.7
Do.....	do	145467	do	do	208	173	43	43.6	20.9	6.8
Do.....	do	145468	Female	do	207	155	41	2.0	19.8	6.6
Do.....	do	145469	do	Moderately worn	193	188	40	40.6	20.1	7.2
Do.....	do	145470	Male	Much worn	204	193	42	42.6	19.8	6.6
<i>E. perlavus</i> .....	Pulo Laut	151918	do	Moderately worn	196	177	42	40.8	18.4	6.4
Do.....	do	151919	Female	do	189	181	39	39.7	18.4	6.4
Do.....	do	151920	do	do	179	179	39	38.9	18.4	6.8
Do.....	do	151921	Male	do	198	182	40	42.2	20.0	6.7
Do.....	do	151922	do	do	187	171	40	41.4	20.1	6.8
Do.....	do	151923	do	do	197	177	39	41.2	19.7	6.8
Do.....	do	151924	do	do	196	183	41	40.4	19.7	6.9
Do.....	do	151925	Male	do	198	174	40	40.4	19.7	6.4

Measurements of rats of the *Epimys rajah* group—Continued.

Name.	Locality.	Catalogue No.	Sex.	State of wear of teeth.	Head and body.	Tail.	Hind foot.	Condylar-basal length of skull.	Zygomatic width.	Maxillary tooththrow (alveoli).
<i>E. perflavus</i> ...	Pulo Laut.....	151926	Female	Moderately worn	188	169	39	.....	18.9	6.4
Do.....	do.....	151927	.....	do.....	198	168	40	42.2	20.1	6.7
Do.....	do.....	151928	Female	do.....	183	177	38	39.9	19.5	6.6
<i>E. ubecus</i> ...	Pulo Sebuku.....	151929	.....	do.....	172	.....	36	34.8	17.4	5.9
Do.....	do.....	151930	do.....	Slightly worn	158	125	39	35.0	17.0	5.9
Do.....	do.....	151931	Male	Moderately worn	177	140	37	37.5	18.1	5.8
Do.....	do.....	151933	do.....	Unworn	136	115	33	31.3	16.0	5.7
<i>E. saturatus</i> ...	Pulo Panebangan	145521	.....	Moderately worn	206	171	41	41.0	20.4	6.7
Do.....	do.....	145522	Male	.....	209	171	41	41.3	20.2	6.6
Do.....	do.....	145523	do.....	do.....	197	186	41	41.1	20.6	6.3
Do.....	do.....	145524	do.....	do.....	200	163	41	39.9	20.0	6.6
Do.....	do.....	145525	Female	Much worn	198	178	39	40.4	20.5	6.5
Do.....	do.....	145526	Male	Moderately worn	190	165	41	39.2	19.8	6.4
Do.....	do.....	145527	Female	do.....	187	142	41	40.0	19.0	6.4
Do.....	do.....	145528	Male	do.....	204	181	41	41.1	20.3	6.2
Do.....	do.....	145529	do.....	do.....	194	157	41	39.7	20.4	6.5
Do.....	do.....	145530	Female	do.....	200	154	40	39.6	18.8	6.5
Do.....	do.....	145531	do.....	Much worn	195	165	39	40.8	.....	6.6
Do.....	do.....	145532	do.....	do.....	200	168	39	41.6	21.0	6.5
Do.....	do.....	145533	.....	Moderately worn	198	157	39	40.5	20.0	6.3
Do.....	do.....	145534	Female	do.....	194	156	40	39.3	19.8	6.7
Do.....	do.....	145535	do.....	Much worn	200	155	40	40.8	19.5	6.8
Do.....	do.....	145536	Male	Moderately worn	206	174	41	40.3	20.3	6.6
Do.....	do.....	145537	.....	Much worn	.....	.....	.....	42.7	.....	6.2
Do.....	do.....	145538	Male	Moderately worn	189	181	40	40.7	19.3	6.5
Do.....	do.....	145539	do.....	do.....	201	171	40	40.2	.....	6.5
Do.....	do.....	145540	Female	do.....	188	162	39	39.9	19.6	6.7
Do.....	do.....	145541	do.....	do.....	180	153	39	.....	.....	6.7
Do.....	do.....	145542	do.....	do.....	187	142	40	39.2	19.0	6.6
Do.....	do.....	145543	do.....	do.....	.....	.....	.....	39.5	19.3	6.7

## EPIMYS KINA (Bonhote.)

1903. *Mus kina* BONHOTE, Ann. Mag. Nat. Hist., ser. 7, vol. 11, p. 124, January, 1903.

Four adult specimens of *Epimys kina* were collected at Balik-Papan Bay, and one very young one along the Kendawangan River. They differ very slightly, if at all, from typical *E. cremoriventer* Miller.<sup>1</sup>

(For measurements see table, p. 113.)

## EPIMYS SPATULATUS, new species.

*Type*.—Skin and skull of adult male, Cat. No. 145499, collected on Pulo Lamukotan, off west coast of Borneo, May 10, 1907, by Dr. W. L. Abbott. Original number, 5214.

*Diagnostic characters*.—A member of the *Epimys cremoriventer* group<sup>2</sup> distinguished by its large size and the widened extremity of the nasals.

*Color*.—Type: Upper parts of head, neck, and body, a grizzly mixture of ochraceous buff and dark brownish, the two colors in about equal proportions; sides of head, neck, and body, and outer sides of

<sup>1</sup> Proc. Biol. Soc. Wash., vol. 13, p. 144, April 21, 1900.

<sup>2</sup> See Bonhote, Fasc. Malay., Zool., vol. 1, pp. 34, 36, October, 1903.

legs similar, but the ochraceous buff, lighter and duller and with very little admixture of other color, except the grayish bases of hairs showing through; entire under parts, including inner sides of legs, creamy white, feet dirty whitish, ears brownish with a few inconspicuous short hairs; tail light brownish above, but gradually lightening to dirty whitish for a narrow area beneath.

*Pelage.*—Pelage of three types of hairs: (1) soft, rather wavy normal hair, grayish at base, with a conspicuous subapical ochraceous ring and an inconspicuous dark brownish apex, these hairs often partaking of the nature of underfur, and with very little of the ochraceous coloring; (2) numerous flattened grooved spines, straw yellowish basally and centrally, dark brownish apically and marginally; (3) rather long slender bristles, generally blackish in color throughout, present only along middle line of back. On the light under parts the short hairs and spines are uniformly creamy white throughout. Middle portion of tail with eleven scales to the centimeter, each subtended by three brownish hairs, equaling a scale and a half in length. Whiskers very long, 65 mm., reaching as far back as shoulders.

*Skull and teeth.*—The skull of *Epimys spatulatus* has the same general shape as the skulls of other species of the *cremoriventer* group, but it is distinctly larger, the brain case absolutely and relatively longer, the rostrum larger and heavier, and the nasals relatively wider at the extremity. The teeth are relatively smaller than they are in other species.

*Measurements.*—External measurements of the type taken by collector: Head and body, 158 mm.; tail, 197; hind foot with claws, 31. Cranial measurements of the type: Condyllo-basal length, 34.3; zygomatic breadth, 16.4; width of brain case above roots of zygomatics, 15.6; interorbital constriction, 5.7; length of nasals, 13.7; width of nasals at extremity, 4.8; maxillary tooth row, alveoli, 6.2.

*Specimens examined.*—One, the type.

*Remarks.*—*Epimys spatulatus* differs from *Epimys kina* Bonhote<sup>1</sup> mainly in its larger size.

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<sup>1</sup> Ann. Mag. Nat. Hist., ser. 7, vol. 11, p. 124, January, 1933.



## Measurements of cream-bellied rats.

Name.	Locality.	Catalogue No.	Sex.	State of wear of teeth.	Head and body. <sup>1</sup>	Tail. <sup>1</sup>	Hind foot. <sup>1</sup>	Condylar-basal length.	Zygomatic width.	Maxillary tooththrow (alveoli).
<i>E. kina</i> .....	Balik Papan Bay.	154302	Female..	Moderately worn.	mm. 124	mm. 178	mm. 28	mm. 29.8	mm. 15.0	mm. 6.2
Do.....	do.....	154303	Male.....	do.....	130	174	29	30.0	16.0	6.1
Do.....	do.....	154304	do.....	do.....	135	185	29	30.0	15.6	6.1
Do.....	do.....	154305	Female..	Much worn.	140	185	29	32.0	15.9	6.4
<i>E. spatulatus</i> ...	Pulo Lamukotan.	154499	Male.....	Moderately worn.	153	197	31	34.3	16.4	6.2

## TRICHYS LIPURA Günther.

1876. *Trichys lipura* GÜNTHER, Proc. Zool. Soc. London, 1876, p. 739, fig. 2, p. 740; fig. 2a; p. 741, pl. 71. Type-locality, Borneo, opposite island of Labuan. (See also p. 424 of foregoing reference.)

Two specimens of this species of brush-tailed porcupine were taken by Doctor Abbott, one in southwestern, one in southeastern Borneo.

*Measurements*.—Cat. No. 145571, adult male, Sungei Matan, and Cat. No. 151880, adult female, Saratok River, respectively, head and body, 420, 445 mm.; tail vertebrae, 200, 190; hind foot, 65, 64; greatest length of skull, 85.6, 79.8; zygomatic width, 45.8, 44.3; greatest length of nasals, 23.8, 23.7; maxillary tooththrow (alveoli). 14.8, 14.5.

## ACANTHION LONGICAUDUM (Marsden).

1810. *Hystrix longicauda* MARSDEN, History of Sumatra, ed. 3, 1811, p. 118, name only, without description, and pl. 13 n. 1., with legend, "The Landak, *Hystrix longicauda*. Published by W. Marsden, 1810." Type-locality, Sumatra.

1907. *Acanthion crassispinis* LYON (not Günther), Proc. U. S. Nat. Mus., vol. 32, p. 581, June 29, 1907.

Three specimens of porcupine from southwestern Borneo may be referred to *Acanthion longicaudum*. It is not probable that the Bornean *Acanthion* is the same as the Sumatran one, but there is no satisfactory material from Sumatra in the U. S. National Museum to permit of comparisons, and no name so far as I know has been proposed for a Bornean *Acanthion*. In 1907 I applied Günther's name *crassispinis*<sup>3</sup> to the Bornean *Acanthion*. Mr. Gerrit S. Miller, jr., has subsequently examined the type of that species in comparison with specimens of my *Thecurus sumatræ*<sup>4</sup> and reports that the two are congeneric, but distinct species.

<sup>1</sup> Collector's measurements.<sup>2</sup> Type.<sup>3</sup> Proc. Zool. Soc. London, 1876, p. 736.<sup>4</sup> Proc. U. S. Nat. Mus., vol. 32, p. 581, June 29, 1907.

The specimens collected by Doctor Abbott are as follows: (a) Cat. No. 153974, from the Kendawangan River, skull of a very young male, having but two cheek-teeth in each half of the jaw. This specimen has four upper incisors, a pair of slender rounded incisors lying in front of and resting on the anterior face of the usual incisors. They are scarcely large enough to be functional and remind one of the hinder pair of incisors found in the Lagomorphs. (b) Cat. No. 145572, from the Semandang River, skull, without skin. The permanent molars are in place, but the milk molars have not yet been shed. (c) Cat. No. 153737, skin and skull of an adult male from the Kendawangan River. Its principal measurements are: Head and body, from dried skin, 630 mm.; tail, from dried skin, 80; hind foot, from dried skin, 85; weight, 22 pounds (10 kgs.); greatest length of skull, 133; zygomatic width, 64; greatest length of nasals, 62.

Porcupines seemed the usual inhabitants of caves [southeast Borneo], but except the one *Trichys* none were caught.—W. L. A.

**AILURIN PLANICEPS (Vigors and Horsfield).**

1828. *Felis planiceps* VIGORS and HORSFIELD, Zool. Journ., vol. 3, p. 450, pl. 12.

Type-locality, Sumatra.

1855. [*Felis*] (*Ailurin*) [*planiceps*], GERVAIS, Hist. Nat. Mamm., vol. 2, p. 87.

Five specimens of this cat were secured in southwestern Borneo. For exact localities and measurements see table below. I have carefully compared this series with an adult female from the Siak River, Sumatra, and can find no characters by means of which the Bornean specimens may be distinguished from the one from Sumatra.

*External and cranial measurements of Ailurin planiceps.*

Locality.	Catalogue No.	Sex and age.	Head and body. <sup>1</sup>	Tail vertebrae. <sup>1</sup>	Hind foot with claws. <sup>1</sup>	Weight. <sup>1</sup>	Weight.	Condylar-basal length.	Zygomatic breadth.	Postorbital constriction.	Width of brain case above roots of zygomatica.	Maxillary toothrow (alveoli).
Little Siak River, Sumatra.	144119	Female, adult.	mm. 490	mm. 169	mm. 104	lbs. ....	kilos. ....	mm. 92.0	mm. 56.4	mm. 20.5	mm. 37.5	mm. 32.3
Sempang River, Borneo.	145591	.....do.....	464	148	99	4½	1.9	89.5	56.5	21.7	37.0	31.0
Do.....	145593	.....do.....	455	130	99	3½	1.7	85.7	56.2	20.0	37.0	29.4
Do.....	145594	.....do.....	150	100	100	3½	1.5	89.7	56.3	20.5	36.7	32.0
Do.....	145592	Male, adult....	505	135	107	4½	2.2	97.0	63.5	21.2	39.0	34.0
Kendawangan River, Borneo.	153849	Male(?), adult.	446	149	102	4	1.8	90.0	57.0	21.2	37.5	33.0

<sup>1</sup> Collector's measurements.

## FELIS BENGALENSIS, of authors.

1907. *Felis bengalensis*, LYON, Proc. U. S. Nat. Mus., vol. 33, p. 559, December 24, 1907.

Two skins with skulls from the Kendawangan River, an adult female and a young female. They are brighter in color and apparently smaller in size than is the tiger cat from Sumatra. The young tiger cat from the Landak River recorded by me in 1907 is also brightly colored. An immature cat from Pahang, Malay Peninsula, of about the same age as the last is of the same dull color as that from Sumatra.

Measurements of the adult female, Cat. No. 153845: Head and body, 495 mm.; tail, 195; hind foot, 110; weight, 4 pounds (1.8 kilos); greatest length of skull, 84.7; condylo-basal length, 77.3; zygomatic breadth, 57.7; width of brain case above zygomata, 40.4; interorbital constriction, 14.6; maxillary tooththrow (alveoli), 26.0.

Stomach filled with rats.—W. L. A.

## ARCTICTIS BINTURONG (Raffles).

1822. *Viverra? binturong* RAFFLES, Trans. Linn. Soc. London, vol. 13, p. 253. Type-locality, Sumatra.

Skin and skull of an immature female, Cat. No. 153840, from the Kendawangan River. The last permanent molars above are just level with alveoli. The skin is generally black, coarsely grizzled with buffy.

*Measurements*.—Head and body 700 mm.; tail, 688; hind foot, 121; weight, 13 pounds (5.9 kilos); condylo-basal length of skull, 123; zygomatic breadth, 64.3; width of brain case above roots of zygomata, 44.2; maxillary tooththrow (alveoli), 40.3.

## VIVERRA TANGALUNGA (Gray).

1832. *Viverra tangalunga* GRAY, Proc. Zool. Soc. London, 1832, p. 63.

1906. *Viverra tangalunga*, MILLER, Proc. U. S. Nat. Mus., vol. 31, p. 61, July 23, 1906, Karimata Island.

Eighteen specimens of *Viverra tangalunga* were collected by Doctor Abbott on Borneo, and one each on Pulos Panebangan, Bauwal, and Laut, and three on Karimata Island.

(For measurements and exact localities in Borneo see table, p. 116.)

Measurements of *Viverra tangalunga*.

Locality.	Catalogue No.	Sex and age.	Head and body. <sup>1</sup>	Tail. <sup>1</sup>	Hind foot. <sup>1</sup>	Weight. <sup>2</sup>	Condylar-basal length.	Zygomatic width.	Maxillary tooththrow (alveoli).
			mm.	mm.	mm.	kilos.	mm.	mm.	mm.
Sempang River.....	145338	Male, adult.....	675	350	107	3.7	117.6	58.0	46.8
Do.....	145339	Female, adult.....	685	325	104	4.0	114.3	54.8	43.1
Foot of Gunong Palung.....	145340	Female, young adult.....	663	330	103	.....	113.7	54.3	44.0
Kumbang River.....	145341	Female, very young.....	515	240	94	1.8	98.9	41.6	.....
Kendawangan River.....	153842	Male, adult.....	635	300	104	3.0	111.0	58.3	44.2
Do.....	153843	Female, adult.....	630	315	103	3.2	108.7	57.5	42.9
Do.....	153844	Male, old.....	620	313	105	3.2	112.5	57.7	44.7
Klumpang Bay.....	151868	Female, young adult.....	606	310	100	3.2	107.5	53.1	41.5
Do.....	151869	Male, young adult.....	600	335	103	2.7	110.2	54.5	42.8
Do.....	151870	Female, young adult.....	615	300	100	2.5	109.4	54.0	42.6
Do.....	151871	Male, adult.....	665	275	101	4.0	114.9	60.6	44.6
Saratok River.....	151872	Female, adult.....	640	300	103	3.6	110.6	56.3	43.5
Do.....	151873	Male, old.....	662	315	109	4.0	115.5	61.4	45.3
Balik Papan Bay.....	154354	Male, adult.....	620	315	95	3.2	113.0	58.4	46.2
Do.....	154355	Male.....	640	300	98	3.4	114.7	58.0	45.6
Do.....	154356	.....do.....	600	310	98	2.8	.....	.....	.....
Do.....	154357	Male, adult.....	605	315	100	3.2	110.0	57.3	43.4
Do.....	154358	.....do.....	643	320	106	3.6	113.9	59.6	44.7
Pulo Panebangan.....	145337	Female, old.....	650	310	105	4.7	111.4	59.0	41.7
Pulo Lant.....	151867	Female, adult.....	610	310	103	2.8	111.8	53.5	43.6
Pulo Bauwal.....	153841	.....do.....	635	305	100	4.0	112.3	55.0	43.9

<sup>1</sup>Collector's measurements.    <sup>2</sup>Collector's measurements in pounds and quarters computed to kilograms.

## PARADOXURUS PHILIPPINENSIS (Jourdan).

1837. *Paradoxurus philippinensis* JOURDAN, Comptes Rendus, vol. 5, p. 523,

1837. Type-locality, Philippine Islands, Luzon and Mindanao.

1885. *Paradoxurus philippinensis*, BLANFORD, Proc. Zool. Soc. London, 1885, p. 800.

1907. *Paradoxurus philippinensis*, LYON, Proc. U. S. Nat. Mus., vol. 33, p. 559, December 24, 1907. Kapuas River region.

Dr. W. L. Abbott has collected three additional specimens of *Paradoxurus* on Borneo since his first expedition in 1905, two from the Sempang River and one from Klumpang Bay. I have followed Blanford in calling them *P. philippinensis*. Jourdan's account is very meager and there are no really good specimens from the Philippines in the National Museum. Two skins collected by Dr. E. A. Mearns in the Philippine Islands, one of them young and the other without a skull, show no striking differences from the Bornean specimens.

(For measurements see table, p. 117.)

## ARCTOGALIDIA STIGMATICA (Temminck).

1835. *Paradoxurus stigmaticus* TEMMINCK, Esquisses Zool. Côte de Guinée, 1st part, Mamm., p. 120. Type-locality, Doeson (or Dusan) River, southern Borneo.

1907. *Arctogalidia stigmatica*, LYON, Proc. U. S. Nat. Mus., vol. 33, p. 559, December 24, 1907. Landak River, Borneo.

Two specimens from Klumpang Bay, southeastern Borneo. None were secured in the regions of the Kendawangan or Sempang rivers.

*Measurements.*—See table, page 117.

## Measurements of viverrids.

Name.	Locality.	Catalogue No.	Sex and age.	Head and body. <sup>1</sup>	Tail. <sup>1</sup>	Hind foot. <sup>1</sup>	Weight. <sup>2</sup>	Condylar-basal length.	Zygomastic width.	Maxillary tooththrow (alveoli).
<i>Arctogalidia stigmatica</i> .	Klumpang Bay....	151874	Male, adult.....	mm. 555	mm. 600	mm. 94	kilos. 2.7	mm. 108.7	mm. 63.5	mm. 38.0
Do.....	do.....	151875	Female, adult....	437	495	80	1.4	94.0	51.0	33.9
<i>Paradorurus philippinensis</i> .	Sempang River....	145342	.....do.....	515	420	86	2.3	92.6	54.5	32.4
Do.....	do.....	145343	Male, adult.....	516	400	80	2.3	99.2	60.3	35.8
Do.....	Klumpang Bay....	151876	Male, young.....	420	370	73	.....	84.0	48.0	.....
<i>Hemigalus hardwickii</i> .	Balik Papan Bay...	154353	Male, adult, nearly. <sup>3</sup>	474	310	77	1.5	93.3	44.0	36.5
<i>Herpestes brachyurus</i> .	Kendawangan River.	153850	Female, old.....	395	218	85	1.3	81.2	51.0	31.2
Do.....	do.....	153851	.....do.....	445	250	90	1.4	88.8	51.0	32.5
Do.....	Balik Papan Bay...	154351	Male, adult.....	422	245	87	1.0	88.2	51.5	33.5
Do.....	do.....	154352	Male, old.....	445	230	90	1.5	88.6	53.9	33.5

## HEMIGALUS HARDWICKII (Gray).

1830. *Viverra hardwickii* GRAY, Spic. Zool., vol. 2, p. 9.

One specimen; an adult male, from Balik Papan Bay. It is uniform in size and color with specimens from northern Borneo, as well as from Sumatra and the Malay Peninsula.

(For measurements see table above.)

## HERPESTES SEMITORQUATUS (Gray).

1846. *Herpestes semitorquatus* GRAY, Ann. Mag. Nat. Hist., vol. 18, 1846, p. 211.

1907. *Herpestes semitorquatus*, LYON, Proc. U. S. Nat. Mus., vol. 33, p. 559, December 24, 1907.

Skin and skull of a young male from Sanggau, Kapuas River; probably represents this species, but it is too young to determine positively.

## HERPESTES BRACHYURUS (Gray).

1837. *Herpestes brachyurus* GRAY, Mag. Nat. Hist., vol. 1, p. 578. Type-locality, Indian Islands.

Four specimens—two from the Kendawangan River and two from Balik Papan Bay.

(For measurements see table above.)

## CYNOGALE BARBATUS (Müller.)

1838-39. *Potamophilus barbatus* MÜLLER, Tijdschr. Natuurl. Gesch. Physiol., vol. 5, p. 142.

Six specimens of this interesting animal were secured by Doctor Abbott. Modern authors have uniformly referred the Bornean *Cynogale* to the species described by Gray<sup>4</sup> under the name *bennettii*,

<sup>1</sup> Collector's measurements.

<sup>2</sup> Collector's measurements in pounds and quarters computed to kilograms.

<sup>3</sup> m<sup>3</sup> halfway up.

<sup>4</sup> Ann. Mag. Nat. Hist., vol. 1, 1837, p. 579.



from Sumatra. A careful comparison of a fine old skull of a female from Aru Bay, Sumatra, with the present series from Borneo convinces me that the Bornean and Sumatran forms represent distinct species. The skull of *Cynogale barbatus* is slightly larger than that of *C. bennettii*, has more spreading zygomata, a more inflated brain-case and a less conspicuous post orbital constriction, the teeth are larger and heavier, the most noticeable difference being in the last upper molars. Müller's figure<sup>1</sup> of the skull shows that his specimen was of the same type as the present series of Bornean skulls. (For a comparison of measurements of the two forms, see table below.) Externally the two forms are essentially alike. The two Sumatran specimens, however, are rather lighter in color on the under parts than are the Bornean skins.

Three embryos the size of walnuts.—W. L. A.

Uterus contained two embryos nearly mature.—W. L. A.

*Measurements of Cynogale bennettii and C. barbatus.*

Locality.	Catalogue No.	Sex and age.	Head and body. <sup>2</sup>	Tail vertebrae. <sup>2</sup>	Hind foot with claws. <sup>2</sup>	Weight. <sup>2</sup>	Weight.	Condylo-basal length.	Zygomatic width.	Breadth of brain-case above roots of zygomata.	Mastoid width.	Post orbital constriction.	Maxillary tooth-row (alveoli).
Aru Bay, Sumatra.	143621	Female, old...	mm. 617	mm. 180	mm. 106	lbs. 7 $\frac{3}{4}$	kilos. 3.5	mm. 121.0	mm. 61.0	mm. 35.8	mm. 43.0	mm. 10.2	mm. 48.7
Siak River, Sumatra.	144122	Male, young <sup>3</sup>	520	185	103	4 $\frac{3}{4}$	2.2	110.0	53.3	36.5	41.5	15.0	47.0
Kendawangan River, Borneo.	153848	.....do. <sup>4</sup> .....	440	150	90	2 $\frac{1}{4}$	1.0	92.0	46.0	36.0	37.7	17.8	.....
Sempang River, Borneo.	145587	Female, young adult.	650	140	111	10	4.5	122.4	61.2	37.3	46.5	13.2	49.3
Do.....	145588	Female, adult	648	200	110	12	5.4	123.5	66.0	38.8	45.5	14.2	50.3
Do.....	145589	.....do.....	600	205	105	12 $\frac{1}{4}$	5.6	120.0	66.0	40.7	48.0	14.8	47.0
Do.....	145590	Adult.....	.....	.....	.....	.....	.....	123.3	64.0	39.7	.....	13.4	49.8
Kendawangan River, Borneo.	153847	Female, young adult.	595	120	102	7	3.2	114.0	60.0	37.5	45.0	13.0	47.5

LUTRA LOVII Günther.

1876. *Lutra loyii* GÜNTHER, Proc. Zool. Soc. London, p. 736. Type-locality, Borneo, opposite island of Labuan.

1907. *Lutra loyii*, LYON, Proc. U. S. Nat. Mus., vol. 33, p. 560, December 24, 1907.

Two specimens from the Kapuas River region collected in 1905.

<sup>1</sup> Verh. Nat. Gesch. Nederl. Bezitt., pl. 17, 1839-1844.

<sup>2</sup> Measurements by collector.

<sup>3</sup> Last upper molars just appearing through alveolus.

<sup>4</sup> Last milk molars and canines still in place.

## AONYX CINEREA (Illiger).

1815. *Lutra cinerea* ILLIGER, Abh. Akad. Berlin, 1811, 1815, p. 99. Type-locality, near Batavia, Java.

A specimen of the clawless otter, a young adult female, Cat. No. 151879, was taken on Pulo Laut. The teeth are moderately large, about the size found in a specimen from the Kinabatangan River, northern Borneo.<sup>1</sup> The shape of the ascending ramus of the mandible closely resembles that of a specimen from Pulo Setoko, Rhio-Linga Archipelago.<sup>1</sup> The skull is smaller than skulls of other clawless otters in the collection, but it is not so old.

*Measurements*.—Head and body, 460 mm.; tail, 310; hind foot, 95; weight, 5½ pounds, equals 2.5 kilos; basal length of skull, 79.3; zygomatic width, 58.9; maxillary toothrow (alveoli), 29.6.

## PUTORIUS NUDIPES Desmarest.

1822. *Mustela nudipes* DESMAREST, Mammalogie, p. 537, 1822. Type-locality, Java.

1842. *Putorius nudipes*, F. CUVIER, Hist. Nat. Mamm., Table method., p. 3, 1842.

One specimen was secured at Tjantung, southeastern Borneo. The general color of body, above and below, is tawny ochraceous. A narrow streak from occiput, over nape to between shoulders, and sides of neck, including front of shoulders, are a lighter and brighter tawny ochraceous; head, including ear, whitish or cream color; tail, between clay color and ochraceous, with the terminal third buffy.

*Measurements*.—Head and body, 366 mm.; tail, 222; hind foot, 58.

The single *Putorius* was shot as it was trying to enter a cave.—W. L. A.

## MUSTELA HENRICII Westerman.

1848-1854. *Mustela (Martes) henricii* WESTERMAN, Bijdr. Dierk, vol. 1, p. 13, and unnumbered plate. Type-locality, Padang, Sumatra. (See Jentink, Mus. d'Hist. Nat. Pays-Bas, vol. 9, Cat. Osteol. Mamm. Leiden, 1887, p. 112.)

1901. *Mustela flavigula henricii*, BONHOTE, Ann. Mag. Nat. Hist., ser. 7, vol. 7, p. 346, April, 1901.

Doctor Abbott collected two specimens of the yellow-throated marten in southwestern Borneo and one in southeastern Borneo. By a singular coincidence the three Bornean specimens are all females, and two from Sumatra are both males. There are no essential differences between the skins from the different islands. One of the Bornean specimens, however, Cat. No. 145579, from Gunong Palung, is generally darker than any of the others, and the anterior portions of the upper parts are practically as dark as are the posterior portions and tail. The other four are distinctly bicolor above. The skulls and teeth of the Sumatra martens, the males, are distinctly

<sup>1</sup> See Proc. U. S. Nat. Mus., vol. 36, pl. 39, June 1, 1909.

larger than those in the Bornean marten, the females. The difference in size is about the same as that usually found between the two sexes in the Mustelidæ.

(For measurements see table below.)

*Measurements of specimens of Mustela henricii.*

Locality.	Catalogue No.	Sex and age.	Head and body. <sup>1</sup>	Tail. <sup>1</sup>	Hind foot. <sup>1</sup>	Weight. <sup>2</sup>	Condylar-basal length.	Zygomatic width.	Maxillary toothrow (alveoli).	Mandibular toothrow (alveoli).
Sumatra:			mm.	mm.	mm.	kilos.	mm.	mm.	mm.	mm.
Makapan.....	144123	Male, adult.....	445	370	99	1.4	.....	.....	26.3	32.8
Kompei.....	144124	.....do.....	458	340	100	1.8	87.3	52.4	28.2	33.3
Borneo:										
Sandakan.....	32179	Female, adult.....	.....	.....	.....	.....	.....	44.8	24.5	30.3
Sungei Matan.....	143578	.....do.....	435	340	93	1.1	80.8	47.7	24.2	29.2
Gunong Palung.....	145579	.....do.....	442	365	94	.....	80.5	45.1	24.8	29.6
Pamukang Bay.....	151877	.....do.....	425	305	90	.....	81.2	46.9	24.3	31.1

<sup>1</sup> Collector's measurements.

<sup>2</sup> Collector's measurements in pounds and quarters computed to kilograms.

**HELARCTOS EURYSPILOS** Horsfield.

1826. *Helarctos eurypilus* HORSFIELD, Zool. Journ., vol. 2, pp. 221-234, pl. 7.

1907. *Helarctos eurypilus*, LYON, Proc. U. S. Nat. Mus., vol. 33, p. 561, December 24, 1907.

Since 1905 Doctor Abbott secured seven additional specimens of the Bornean sun bear, six skulls obtained from natives in southwestern Borneo, and a skin and skull collected at Pamukang Bay. The present series of skulls shows that the differences between the Bornean and Sumatran sun bears are not as great as I was led to believe in 1907, but the differences pointed out then, hold in the main, as may be seen on reference to the table of measurements on page 121. There is no doubt as to the distinctness of the two forms. The Sumatran specimens have smaller collars and the light area of the nose is more conspicuous than in the single Bornean skin.

Bears seem to be pretty common wherever there is a plantation of cocoanuts. Some of the trees are said to be dead or dying as a result of their depredations. The bears climb up and eat the "heart" out of the palm. In a small grove of about ninety trees, near Tanjong Pamukang, the bears had destroyed about half the trees. It was full moon during my stay there, so the owners said it was no use to watch for bears, as they only came out on dark nights. The Dutch authorities took away all the guns about a year ago, so now the animals have it all their own way.—W. L. A.

Measurements of Bornean and Sumatran sun bears.

Dimensions.	Cat. No. 14244, Landak River, old adult.	Cat. No. 145580, young adult, Sempang River.	Cat. No. 153835, adult, Kendawangan River.	Cat. No. 153836, young adult, Kendawangan River.	Cat. No. 153837, adult, Kendawangan River.	Cat. No. 153838, old adult, Kendawangan River.	Cat. No. 153839, adult, Kendawangan River.	Cat. No. 151866, adult male, Pamukang Bay.	Cat. No. 123138, old adult, male, Kateman River, Sumatra.	Cat. No. 123139, adult female, Kateman River, Sumatra.
Basal length.....mm.	189	.....	185	.....	.....	206	.....	194	215	203
Basilar length.....mm.	186	.....	182	.....	.....	202	.....	190	210	199
Condylar-basal length.....mm.	205	.....	203	.....	.....	220	.....	210	234	220
Palatal length.....mm.	102	108	100	93	91	109	102	110	117	114
Greatest length.....mm.	222	220	216	205	.....	243	222	235	256	230
Zygomatic width.....mm.	176	.....	164	165	164	182	173	171	208	183
Mastoid width.....mm.	134	126	130	125	125	148	136	136	156	159
Width of brain case above zygomatic.....mm.	92	101	94	96	96	96	97	97	104	103
Width at postorbital processes.....mm.	75	68	74	73	64	74	70	78	88	81
Least interorbital width.....mm.	60	56	58	58	55	59	60	64	69	62
Least width of palate between last upper molars.....mm.	36	37	38	32	38	36	40	38	41	37
Posterior edge of last upper molar (alveolus) to palation.....mm.	28	29	28	23	24	27	26	26	36	26
Posterior edge of last upper molar (alveolus) to tip of pterygoid.....mm.	60	.....	60	.....	52	70	63	61	66	62
Alveolar length of last three upper cheek teeth combined.....mm.	45	43	40	43	44	44	45	45	44	46
Antero-posterior diameter of upper canine at alveolus.....mm.	23	23	22	20	21	26	23	27	25	23
Head and body <sup>1</sup> .....mm.	.....	.....	.....	.....	.....	.....	.....	1,260	1,190	1,125
Tail <sup>1</sup> .....mm.	.....	.....	.....	.....	.....	.....	.....	90	40	30
Weight <sup>1</sup> .....pounds.	.....	.....	.....	.....	.....	.....	.....	124	138	105
Weight.....kilograms.	.....	.....	.....	.....	.....	.....	.....	56	63	48
Height at shoulders <sup>1</sup> .....mm.	.....	.....	.....	.....	.....	.....	.....	.....	.....	490

<sup>1</sup>Collector's measurements.

TUPAIA SPECIOSA (Wagner).

1840. *Cl[adobates] speciosa* WAGNER, Schreber's Säugethiere, Supplbd. 2, 1840, p. 43.  
1907. *Tupaia speciosa*, LYON, Proc. U. S. Nat. Mus., vol. 33, p. 562, December 24, 1907.

Nine specimens of this tree-shrew have been taken by Doctor Abbott in Borneo, two in the Kapuas River region, three in south-western Borneo, and four in southeastern Borneo. (For exact localities, see table of measurements, p. 123.) The only adult specimen from the Kapuas region differs in its much larger size, cranially and externally, from Doctor Abbott's other specimens as well as from specimens from northern Borneo. In color and form, however, it resembles the others in all essential respects. It is no older than some of the smaller individuals. Without more material it does not seem advisable to recognize it as a distinct form.

(For measurements see table, p. 123.)

TUPAIA DORSALIS Schlegel.

1857. *Tupaia dorsalis* SCHLEGEL, Handl. boef. Dierk., pt. 1, p. 59, pl. 3, fig. 31, 1857.  
1907. *Tupaia dorsalis*, LYON, Proc. U. S. Nat. Mus., vol. 33, p. 562, December 24, 1907.

One specimen from the Kapuas River, collected in 1905.  
(For measurements see table, p. 123.)

## TUPAIA SPLENDIDULA Gray.

1865. *Tupaia splendidula* GRAY, Proc. Zool. Soc. London, 1865, p. 322. Type-locality, Borneo, probably northern.

Three specimens, two from the Saratok River, Pamukang Bay, and one from the Kendawangan River.

Mr. Oldfield Thomas, of the British Museum, has kindly compared one of the specimens with Gray's type. He remarks:

Comparing 151884 with the type of *splendidula*, it is the best match to that troublesome species which I have yet seen, the color being identical (allowing for a slight bleaching from black to brown in the old specimen), and the hind feet practically the same length. The skull of *splendidula* is, however, certainly rather larger, as you say, but it is a very old specimen. There is no difference other than size that I can see. Condyllo-basal length of 151884, 42.5; of *splendidula*, 44.2.

The largest of the three specimens collected by Doctor Abbott was sent to Mr. Thomas, but the difference in size between the type of *splendidula* and the three specimens from southern Borneo is so slight and the material so limited that it can be attributed to individual variation only.

(For measurements see table, p. 123.)

## TUPAIA LONGIPES (Thomas).

1893. *Tupaia ferruginea longipes* THOMAS, Ann. Mag. Nat. Hist., ser. 6, vol. 11, p. 343, May, 1893.

Five specimens, two from southwestern and one from southeastern Borneo. *Tupaia discolor* Lyon,<sup>1</sup> from Banka, is very close to this form, and in the original description should have been compared with it. A specimen of the present series was sent to Mr. Oldfield Thomas. He remarks as follows:

With regard to *longipes* the differences you note are quite true as far as the type is concerned, but a later specimen from the same region has practically the same warm color on fore back, the same *hypochrysa*-like chest, and the same grayish tail. The skulls are identical, and the size the same.

(For measurements see table, p. 123.)

## TUPAIA CARIMATÆ Miller.

1906. *Tupaia carimatæ* MILLER, Proc. U. S. Nat. Mus., vol. 31, p. 61, July 23, 1906.

In addition to the original series of *Tupaia carimatæ* collected in 1904, Doctor Abbott took one other specimen in 1908.

(For measurements see table, p. 123.)

## TUPAIA INFLATA Lyon.

1906. *Tupaia inflata* LYON, Proc. U. S. Nat. Mus., vol. 31, p. 600, December 18, 1906.

A specimen of a small *Tupaia* taken on Karimata Island in 1908 does not differ essentially from *T. inflata* of Banka and Billiton

<sup>1</sup> Proc. U. S. Nat. Mus., vol. 31, p. 602, December 18, 1906.



Islands. It is a young adult female with a somewhat imperfect skull not suitable for comparison with skulls of the original series. The skin closely resembles the darker individuals of the Banka-Billiton specimens.

(For measurements see table below.)

TUPAIA GRACILIS Thomas.

1893. *Tupaia gracilis* THOMAS, Ann. Mag. Nat. Hist., ser. 6, vol. 12, p. 53, July, 1893.

One example of *Tupaia gracilis* was taken along the Kendawangan River.

(For measurements see table below.)

TUPAIA MINOR Günther.

1876. *Tupaia minor* GÜNTHER, Proc. Zool. Soc. London, 1876, p. 426.

Three small Tupaias are referable to *Tupaia minor*. Two are from the mainland of Borneo, Kendawangan River, and mouth of Sempang River, and third is from Pulo Laut. The latter is yellower underneath than are the mainland specimens, this perhaps due to staining. It is also somewhat darker above, especially the tail. The skull of the Pulo Laut specimen is too badly broken to compare with those of the mainland animals.

(For measurements see table below.)

Measurements of tree shrews.

Name.	Locality.	Catalogue No.	Sex and age.	Head and body. <sup>1</sup>	Tail vertebrae. <sup>1</sup>	Hind foot, with claws. <sup>1</sup>	Greatest length of skull.	Zygomatic breadth.	Maxillary toothrow, exclusive of incisors.
<i>Tupaia dorsalis</i> ...	Kapuas River.....	142247	Female, adult...	mm.	mm.	mm	mm.	mm.	mm.
<i>Tupaia speciosa</i> ...	Sungei Matan.....	145573	Male, adult.....	175	145	43	49.0	22.4	17.1
Do.....	do.....	142247	do.....	207	188	52	57.0	25.1	20.4
Do.....	do.....	145574	Female, adult.....	229	196	55	64.4	29.4	23.2
Do.....	Saratok River.....	151885	do.....	220	180	50	59.2	25.7	20.5
Do.....	Pasir River.....	154339	Male, adult.....	210	180	49	57.7	26.0	20.0
Do.....	Balik Papan Bay.....	154340	Female, adult.....	209	175	50	57.6	26.2	19.6
Do.....	Pamukang Bay.....	154341	Male, adult.....	210	180	51	58.2	27.0	19.9
<i>Tupaia splendida</i> ...	do.....	157883	do.....	210	170	50	56.7	27.0	18.7
Do.....	do.....	151884	do.....	180	130	42	48.0	25.0	17.2
Do.....	Kendawangan River.....	153856	Female, adult.....	173	150	42	.....	25.9	16.5
<i>Tupaia longipes</i> ...	Batu Jurong.....	153852	Male, adult.....	188	157	44	46.4	24.0	16.4
Do.....	do.....	153853	Male, young adult.....	205	195	53	51.0	25.9	19.1
Do.....	Kendawangan River.....	153854	Female, nearly adult.....	192	205	53	48.3	25.0	18.2
Do.....	do.....	153855	Male, adult.....	190	180	53	50.6	25.3	19.4
Do.....	Pangkajene River.....	151882	do.....	213	190	53	51.5	25.3	19.0
<i>Tupaia carinata</i> ...	Karimata Island.....	153860	do.....	213	185	50	53.0	24.8	20.3
<i>Tupaia inflata</i> ...	do.....	153859	Female, adult.....	165	145	40	.....	23.5	16.2
<i>Tupaia gracilis</i> ...	Kendawangan River.....	153858	Male, adult.....	135	156	38	.....	19.5	13.3
<i>Tupaia minor</i> ...	Mouth of Sempang River.....	145575	Female, adult.....	143	174	42	39.0	20.6	13.2
Do.....	Kendawangan River.....	153857	Male, adult.....	130	156	34	33.5	19.2	12.2
Do.....	Pulo Laut.....	151881	do.....	132	148	34	34.6	19.4	12.0
Do.....	do.....	151881	do.....	130	145	34	.....	.....	12.0

<sup>1</sup> Collector's measurements.

## GYMNURA ALBA Giebel.

1909. *Gymnura alba*, LYON, Proc. U. S. Nat. Mus., vol. 36, p. 453, May 27, 1909.

Six specimens from the Sempang River, southwestern Borneo.

(For a full account of and measurements of these specimens see paper referred to above.)

In one of them a nearly mature embryo in utero.—W. L. A.

## GALEOPTERUS BORNEANUS, new species.

*Type*.—Skin and skull of adult female, Cat. No. 151888, U.S.N.M., collected at Tjantung, southeastern Borneo, January 30, 1908, by Dr. W. L. Abbott. Original number 5775.

*Diagnostic characters*.—A medium-sized member of the genus closely resembling the flying lemur from the Malay Peninsula<sup>1</sup> and the one from Bunguran of the Natuna Islands,<sup>2</sup> but skull slightly smaller than that of *G. peninsulæ*, and with distinctly shorter maxillary tooth row and smaller audital bullæ; skull and maxillary tooth row about the same general size as in *G. natunæ*, but braincase and interorbital region distinctly broader and nasals more pinched up into ridge.

*Color*.—Type: Upper surface of head, neck, body, tail, feet, and outer surfaces of limbs varying shades of gray, produced by irregular mixtures of dirty white and blackish, notably about the shoulders and hips the whitish color darkens to a buff yellow. The usual light spotting is found on the feet, and a rather conspicuous white spot is found on each side of the base of the tail. The outer border of the membrane above is dull chestnut. General color of the entire under parts except chin and throat, varying mixtures and shades of dull tawny ochraceous and clay color; chin similar to upper parts and throat, a gradual blending of the colors of the chin with those of the under parts.

*Skull and teeth*.—The skull is of medium size, about equal to that of *Galeopterus natunæ*, but the interorbital constriction is wider, the brain-case decidedly wider, the nasals more pinched up into a ridge, and the rostrum deeper; audital bullæ of about the same size, the palate, posterior nares, and interpterygoid space decidedly wider in the Bornean form. Compared with a skull from the Malay Peninsula, that of the Bornean animal is slightly smaller, with smaller bullæ, less inflated mastoids. The teeth have about the same size that they do in the Malay form, but the tooth row is shorter. The individual teeth appear slightly larger, but the tooth rows have about the same lengths in the Bornean and Natunan forms.

*Measurements*.—See table, page 126.

<sup>1</sup> *Galeopterus peninsulæ* THOMAS, Ann. Mag. Nat. Hist., ser. 8, vol. 2, p. 303, September, 1908. Selangor-Pahang boundary, Malay Peninsula.

<sup>2</sup> *Galopithecus natunæ* MILLER, Smiths. Misc. Coll., vol. 45, p. 50, November 6, 1903, Bunguran Island, North Natunas.

*Specimens examined*.—Two, the type and nearly adult male from the Sempang River.

*Remarks*.—I quite agree with Thomas<sup>1</sup> that there is a resemblance between the flying lemurs of Borneo, the Natunas, and the Malay Peninsula. It is not plausible to suppose that they represent a single species, nor does the rather limited material at hand show this to be the case. Even Thomas himself has recently named the Peninsular form. *Galeopterus borneanus* can not be considered a strikingly distinct species. It is certainly very distinct from *G. aoris* Miller. I can see very little wisdom in Thomas and Wroughton's combining the Aor, Rhio Archipelago, Natuna, and Bornean *Galeopterus* under the name *aoris*.<sup>2</sup> The only real way to settle the case is to get together good series, but meanwhile it seems best to recognize the described forms. Flying lemurs ought to be subject to as much geographic and insular variations as are other groups of mammals.

GALEOPTERUS LAUTENSIS, new species.

*Type*.—Skin and skull of adult female, Cat. No. 151886, U.S.N.M., collected on Pulo Laut off southeastern Borneo, December 23, 1907. Original number, 5679.

*Diagnostic characters*.—A medium-sized member of the genus closely related to the Bornean animal, but slightly larger, with a distinctly longer tooth row and with the mastoids considerably shrunken.

*Color*.—The color is essentially like that of the Bornean animal described above, but the white spotting occurs frequently in larger splotches, and there is more ochraceous in the color of the back.

*Skull and teeth*.—The skull and teeth of *Galeopterus lautensis* closely resemble those of the nearby Bornean animal. The skull is slightly larger, more angular, with a narrower brain-case, and less prominent mastoids. The tooth row is considerably longer.

*Measurements*.—See table, page 126.

*Specimens examined*.—Three; the type, a young one taken with her, and a male from the island of Sebuku.

*Remarks*.—The male from the island of Sebuku is only provisionally referred to *G. lautensis*. It has about the size and general appearance as if it might be the male of that species. Unfortunately there is no material with which to make a satisfactory comparison.

Regarding the type-specimen, Doctor Abbott writes:

This animal has a somewhat interesting history. It was seized by a small forest eagle (*Spizaetus limnaetus*) and the two fell to the ground and were seized by some Malays who observed the occurrence. The place was in a small clearing on the east side of Pulo Laut. There were some gigantic trees standing on the edge of the clearing. The "kubong" was on one of these trees when the hawk grabbed her. She was carrying a newborn young one. There was an old wound full of maggots upon one shoulder,

<sup>1</sup> Ann. Mag. Nat. Hist., ser. 8, vol. 1, p. 254, March, 1908.

<sup>2</sup> Journ. Fed. Malay States Museum, vol. 4, p. 111, 1909.

which had formed quite a large hole in the membrane and laid bare the muscles of the humerus. The disability caused by the wound and being hampered by the young one were the probable cause of its capture by the hawk. Both the hawk and the kubong were brought to me alive that same evening by the Malays who caught them. I have seen *Spizaetus* try to catch *Ratufa*, but I never saw them succeed.

**GALEOPTERUS ABBOTTI, new species.**

*Type*.—Skin and skull of adult female, Cat. No. 145577, U.S.N.M., collected on Pulo Panebangan, off west coast of Borneo, May 16, 1907, by Dr. W. L. Abbott. Original number, 5231.

*Diagnostic characters*.—A small member of the genus, much smaller than the flying lemur from the adjacent island of Borneo, and even smaller than *G. gracilis* Miller<sup>1</sup> from Sirhassen, Natuna Islands.

*Color*.—The color of *Galeopterus abbotti* is essentially like that of *G. borneanus* described above.

*Skull and teeth*.—The chief peculiarity of the skull of *G. abbotti* is its small size. In addition to that it is a rather flat skull, with moderately pinched-up nasals and rather shriveled and shrunken mastoids. The teeth show no peculiarities, but are proportionately as small as the skull.

*Measurements*.—See table below.

*Specimens examined*.—Two, the type and a young male preserved in alcohol.

*Remarks*.—*Galeopterus abbotti* has the smallest skull of any female flying lemur in the National Museum. It is nearly but not quite as small as the skull of the type, a male of *G. pumilus* Miller<sup>2</sup> from the Adang Islands. The skin of single specimen of *G. abbotti* shows well-developed mammae, so that there can be no question as to the sex of it.

*Measurements of adult flying lemurs.*

Name.	Locality.	Catalogue No.	Sex.	Head and body. <sup>3</sup>	Tail. <sup>3</sup>	Hind foot. <sup>3</sup>	Condylar-basal length of skull.	Zygomatic width.	Width of braincase.	Upper tooththrow.
<i>Galeopterus borneanus</i> ...	Tjantung.....	151888	Female.	mm. 415	mm. 248	mm. 78	mm. 70.0	mm. 46.5	mm. 27.0	mm. 35.0
<i>Galeopterus lautensis</i> ....	Pulo Laut.....	151886	do.....	450	299	86	74.0	50.0	24.5	37.7
Do.....	Pulo Sebuk.....	151887	Male.....	350	180	65	61.5	41.3	23.0	32.0
<i>Galeopterus abbotti</i> .....	Pulo Panebangan.	145577	Female.	345	210	62	60.0	40.5	22.4	29.4

<sup>1</sup> Smiths. Misc. Coll., vol. 45, p. 49, November 6, 1903.

<sup>2</sup> Idem, p. 46, November 6, 1903.

<sup>3</sup> Collector's measurements.

<sup>4</sup> Type.

CYNOPTERUS BRACHYOTIS BRACHYOTIS (Müller).<sup>1</sup>

1839. *Pachysoma brachyotis* MÜLLER, Tijdschr. Natuur. Gesch. Physiol., vol. 5, p. 146.

1907. *Cynopterus brachyotis*, LYON, Proc. U. S. Nat. Mus., vol. 33, p. 562, December 24, 1907.

Twenty-five specimens from the Kapuas River, thirteen from the Sempang River, sixteen from the Kendawangan River, and one from Batu Jurong.

(For measurements see table, p. 128.)

## CYNOPTERUS BRACHYOTIS INSULARUM Andersen.

1910. *Cynopterus brachyotis insularum* ANDERSEN, Ann. Mag. Nat. Hist., ser. 8, vol. 6, p. 624, December, 1910. Type-locality, Kangean Island.

Two specimens from Pulo Mata Siri.

(For measurements see table, p. 128.)

## PTEROPUS VAMPIRUS Linnæus.

1758. *Vespertilio vampyrus* LINNÆUS, Syst. Nat., 10th ed., p. 31.

Three specimens from the Kendawangan River and fifteen from Klumpang Bay, all skins and skulls; three skeletons and seven preserved in alcohol from Klumpang Bay.

(For measurements see table, p. 128.)

An immense roost of many thousands of these bats was among the mangroves near the head of Klumpang Bay. The roost was on a small tidal creek a couple of hundred yards from the shore of the bay. The mangroves were all small, not more than 18 to 25 feet high. There were probably at least 15,000 to 20,000 individuals. I fired four shots into different trees and we picked up about thirty-five bats which were wounded and clung to the branches. Those killed outright mostly fell into the water and were lost, either sinking like stones or being swept away by the strong tidal current. Most of the females had young ones with them.—W. L. A.

## PTEROPUS SPECIOSUS Andersen.

1908. *Pteropus speciosus* ANDERSEN, Ann. Mag. Nat. Hist., ser. 8, vol. 2, p. 364, October, 1908. Type-locality, Malanipa Island, off Zamboanga, Philippine Islands.

Five skins and skulls, and three specimens preserved in alcohol from Pulo Solombo Besar, and one skin and skull from Pulo Mata Siri.

Skins and skulls compared with type and paratype of species and found indistinguishable. The color of the fur varies in the species of the *hypomelanus* group within wider limits than generally in *Pteropus*.—Knud Andersen.

<sup>1</sup> The author is indebted to Dr. Knud Andersen for the identifications of many of the fruit bats and leaf-nosed bats.



## Measurements of fruit bats.

Name.	Catalogue No.	Locality.	Sex.	Head and body.	Tail.	Forearm.	Tibia.	Foot.	Ear from crown.	Condylar-basal length.	Maxillary toothrow including canine.
<i>Pteropus speciosus</i> ..	151893	Pulo Solombo Besar	Female	mm. 182	mm. 119	mm. 58	mm. 41.0	mm. 54.0	mm. 21.4		
Do.....	151894	do.....	do.....	182	116	56	42.0	54.0	21.5		
Do.....	151896	do.....	Male	195	119	54	43.0	57.0	22.0		
Do.....	151897	do.....	Female	205	121	57	40.0	56.0	21.3		
Do.....	151898	Pulo Mata Siri.	do.....	205	125	55	40.0	58.0	22.1		
<i>Pteropus vampyrus</i> ..	153861	Kendawangan River	Male	298	184	90	60.0	76.0	28.5		
Do.....	153862	do.....	do.....	296	85	58.0	74.0	28.0			
Do.....	153863	do.....	Female	288	87	59.0	75.0	28.4			
Do.....	151901	Klumpang Bay	Male	292	185	83	57.0	75.0	29.5		
Do.....	151902	do.....	do.....	276	175	85	56.0	71.0	28.4		
Do.....	151915	do.....	do.....	292	179	84	64.0	75.0	29.3		
Do.....	151903	do.....	Female	260	190	86	57.0	72.0	30.1		
Do.....	151910	do.....	do.....	280	178	89	62.0	71.0	27.5		
Do.....	151911	do.....	do.....	280	184	88	60.0	75.0	28.8		
<i>Cynopterus brachyotis</i>	145626	Sempang River	Male	71	10	63	23	13.2	14	26.5	9.4
Do.....	145627	do.....	Female	80	9	61	26	13.1	13	26.7	8.9
Do.....	145628	do.....	do.....	73	9	61	25	13.2	15	26.2	9.3
Do.....	153865	Kendawangan River	Male	100	9	62	25	14.0	14	27.7	9.3
Do.....	153887	do.....	Female	73	9	64	25	15.0	14	26.0	8.8
Do.....	153889	do.....	Male	21	9	60	22	12.2	11	26.0	8.8
Do.....	153892	do.....	Female	65	9	61	23	13.4	14	25.0	8.2
Do.....	153894	do.....	do.....	75	10	62	25	13.5	13	27.0	9.4
Do.....	153896	do.....	do.....	79	10	62	25	14.5	14	26.6	9.3
Do.....	153882	Batu Jurong	Male	.....	.....	.....	.....	.....	.....	26.0	9.2
Do.....	151892	Pamukang Bay	Female	.....	.....	.....	.....	.....	.....	26.1	8.7
<i>Cynopterus brachyotis insularum</i> .	151891	Pulo Mata Siri.	Male	.....	.....	.....	.....	.....	.....	.....	10.0
Do.....	151987	do.....	Female	82	13	67	27	15.2	16	29.2	10.0

<sup>1</sup> Paratype.

## MEGADERMA SPASMA CARIMATÆ (Miller).

1906. *Megaderma carimatæ* MILLER, Proc. U. S. Nat. Mus., vol. 31, p. 63, July 23, 1906.

1907. *Megaderma carimatæ*, ANDERSEN and WROUGHTON, Ann. Mag. Nat. Hist., ser. 7, vol. 19, p. 133, February, 1907.

Thirty-one specimens from Karimata Island. *Megaderma spasma carimatæ* is evidently closely related to the Bornean form of *M. spasma*, differing mainly by its rather longer ear and shorter tibia.

## MEGADERMA SPASMA TRIFOLIUM (Geoffroy).

1907. *Megaderma spasma trifolium* ANDERSEN and WROUGHTON, Ann. Mag. Nat. Hist., ser. 7, vol. 19, p. 132, February, 1907.

Eleven specimens from a small islet northeast of Pulo Bauwal, five from Batu Jurong, and five from Pulo Lamukotan.

(For measurement see table, p. 136.)

These bats were roosting in some small caves on the seashore, just above high-water mark.

## HIPPOSIDEROS LARVATUS (Horsfield).

1878. *Phyllorhina larvata*, DOBSON, Cat. Chiropt. Brit. Mus., p. 137.

1906. *Hipposideros larvatus*, MILLER, Proc. U. S. Nat. Mus., vol. 31, p. 64, July 23,

1906. Karimata Island specimens.

Twenty-seven specimens from the Pangkallahan River, one from the upper Pasir River, four from Pulo Panebangan, six from Pulo Serutu, Karimata Islands, all preserved in alcohol.

(For measurements see table, p. 130.)

HIPPOSIDEROS DYACORUM Thomas.

1902. *Hipposideros dyacorum* THOMAS, Ann. Mag. Nat. Hist., ser. 7, vol. 9, p. 271, April, 1902.

Seven specimens preserved in alcohol from Sungei Matan.

(For measurements see table, p. 130.)

Hanging under a rock on Bukit Sepunchok.—W. L. A.

HIPPOSIDEROS GALERITUS Cantor.

1878. *Phyllorhina galerita*, DOBSON, Cat. Chiropt. Brit. Mus., p. 141.

Twenty-two specimens from Panebangan Island, fourteen from the Pangkallahan River, and eleven from the upper Pasir River, all preserved in alcohol.

(For measurements see table, p. 130.)

Taken in a large cave near Lowatsi (the Pasir River specimens).—W. L. A.

HIPPOSIDEROS INSOLENS, new species.

*Type*.—Adult male preserved in alcohol, skull removed, Cat. No. 154389, U.S.N.M., collected near Lowatsi on the upper Pasir River, southeastern Borneo, December 31, 1908, by Dr. W. L. Abbott. Original number, 6274.

*Diagnostic characters*.—Related to *Hipposideros galeritus*, but forearm, tail, and tibia distinctly longer, though skulls are of the same size.

*Color*.—Type: Specimen taken out of alcohol and temporarily dried. On back general color mummy brown. When the fur is blown open, the terminal third or half of the hairs is seen to be mummy brown, the basal portions Prout's to wood brown; the extreme narrow base of the hairs is buffy. Underparts, terminal portions of hairs, isabella color, extreme basal portion buffy, and intermediate portion dark wood brown. Membranes and naked portions of ears, the usual blackish brown color seen in bats.

*Nose-leaf*.—Vertical posterior portion divided by three vertical ridges into four cells, frontal sac in male only, opening by a transverse slit, two secondary cutaneous leaflets, external to and on each side of horseshoe.

*Ears*.—Short and broad, tip reaching to anterior border of horseshoe when laid forward, furred almost to the tip on outer side, and anterior and posterior margins well furred inside. Height above crown, 11mm.; from meatus, 13; width, 13.

*Wings, membranes, etc.*—Wings from the tarsus, interfemoral membrane well developed. Forearm, 52 mm.; thumb, 7; first finger, 42; second finger, 72; third finger, 58; fourth finger, 58; tibia, 21; foot, 8; calcar, 9; tail, 38.

*Skull and teeth.*—The skull and teeth of *Hipposideros insolens* show no difference from those of *H. galeritus*, not even in size, in spite of the fact that *H. insolens* is a much larger bodied animal. The principal measurements of the type skull are: Greatest length, 17.7 mm.; zygomatic width, 9; mastoid width, 9; interorbital constriction, 2.7; maxillary tooth-row, including canine, 5.8.

*Specimens examined.*—The type and two other specimen, females, all in alcohol, from the same locality.

*Remarks.*—*Hipposideros insolens* is readily distinguished from *H. galeritus* by its distinctly larger body size. (See table of measurements below.) The skulls of the two forms, however, are curiously enough indistinguishable. This is undoubtedly another instance of the not unusual occurrence among bats of two closely related species differing only or mainly in size.

Measurements of *Hipposideros*.

Name.	Catalogue No.	Locality.	Sex.	Head and body.	Tail.	Forearm.	Tibia.	Foot.	Ear from crown.	Condylar-basal length.	Maxillary tooth-row, including canine (alveoli).
				mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
<i>Hipposideros larvatus</i> .	152067	Pangkallahan River.	Male...	67	32	65.0	25.0	12.5	15	23.0	9.0
Do.....	152068	do.....	Female	59	37	62.0	25.0	12.5	18	21.5	8.5
Do.....	152079	do.....	Male...	58	34	62.0	24.0	13.0	18	22.2	8.9
Do.....	152080	do.....	do.....	62	32	63.0	24.0	12.5	18	22.3	8.7
Do.....	152089	do.....	Female	64	37	64.0	23.0	12.0	17	22.2	8.6
Do.....	154387	Upper Pasir River.	Male...	64	32	64.0	24.0	12.0	18	22.4	9.0
Do.....	145608	Pulo Panebangan.	do.....	67	32	62.0	25.0	13.0	16	21.2	8.3
Do.....	145670	do.....	Female	61	34	62.0	24.0	12.5	19	21.4	8.7
Do.....	145671	do.....	do.....	55	28	61.0	22.0	12.0	18	20.0	8.0
<i>Hipposideros dyacorum</i> .	145692	Matan River	do.....	39	21	42.5	17.0	8.5	12	15.2	5.7
Do.....	145694	do.....	do.....	42	21	42.0	17.3	8.0	13	15.0	5.5
<i>Hipposideros galeritus</i> .	152057	Pangkallahan River.	Male...	40	23	42.5	17.4	8.0	11	14.9	5.7
Do.....	152058	do.....	Female	41	21	42.0	15.0	8.3	12	14.2	5.6
Do.....	152060	do.....	Male...	44	22	44.0	17.2	8.0	11	15.4	5.7
Do.....	154391	Upper Pasir River.	Female	42	22	45.0	17.2	8.0	12	15.7	5.9
Do.....	154392	do.....	Male...	44	21	45.0	18.0	8.5	12	15.7	6.0
Do.....	154393	do.....	Female	45	24	47.0	18.0	8.0	12	14.8	6.0
Do.....	154394	do.....	Male...	45	23	44.0	18.0	7.5	12	15.1	5.9
Do.....	145615	Pulo Panebangan.	do.....	42	24	46.0	18.4	8.5	12	15.6	5.8
Do.....	145688	do.....	Female	44	22	47.0	18.0	9.0	12	15.0	5.8
Do.....	145683	do.....	do.....	44	23	47.0	18.0	8.5	13	15.9	6.1
Do.....	145689	do.....	Male...	40	25	47.0	18.5	8.0	13	15.5	5.7
<i>Hipposideros insolens</i> .	154388	Upper Pasir River.	Female	49	38	52.0	22.0	8.2	12	15.5	6.0
Do.....	154389	do.....	Male...	44	38	52.0	21.0	8.0	11	15.0	5.8
Do.....	154390	do.....	Female	49	36	51.0	22.0	8.7	12	15.7	5.8

<sup>1</sup> Type.

## RHINOLOPHUS TRIFOLIATUS Temminck.

1905. *Rhinolophus trifolius*, ANDERSEN, Ann. Mag. Nat. Hist., ser. 7, vol. 16, p. 249, August, 1905.

1907. *Rhinolophus trifolius*, LYON, Proc. U. S. Nat. Mus., vol. 33, p. 563, December 24, 1907.

One specimen from along the Kapuas River in 1905, and four others on later expeditions, three from the Kendawangen River and one from the Sampanahan, all preserved in alcohol.

(For measurements see table, p. 132.)

Hanging beneath a palm leaf in dense hill jungle (Sampanahan River specimen).—W. L. A.

## RHINOLOPHUS AFFINIS Horsfield.

1824. *Rhinolophus affinis* HORSFIELD, Zool. Research, Java.

Fourteen specimens from the Pangkallahan River, and five from the upper Pasir River, all preserved in alcohol.

(For measurements see table, p. 132.)

Taken in a large cave near Lowatsi (of the Pasir specimens).—W. L. A.

## RHINOLOPHUS BORNEENSIS Peters.

1861. *Rhinolophus borneensis*, PETERS, Monatsber. Akad. Berlin, 1861, p. 709.

Five specimens in alcohol from Pulo Panebangan.

(For measurements see table, p. 132.)

## RHINOLOPHUS BORNEENSIS SPADIX (Miller).

1906. *Rhinolophus borneensis spadix*, MILLER, Proc. U. S. Nat. Mus., vol. 31, p. 64, July 23, 1906.

Three specimens from Pulo Serutu and two from Karimata, collected in 1904.

NYCTERIS<sup>1</sup> JAVANICUS (Geoffroy).

1813. *Nycteris javanicus* GEOFFROY, Ann. Mus. Paris, vol. 20, p. 20.

One specimen preserved in alcohol, from the Upper Pasir River.

(For measurements see table, p. 136.)

In a small cave in limestone rock.—W. L. A.

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<sup>1</sup>See Miller, Proc. Biol. Soc. Wash., vol. 22, p. 90, April 17, 1909. I have used the name *Nycteris* instead of *Petalia*, as by recommendation of the International Code *Nycteris* is a different term from *Nycteris*.

Measurements of *Rhinolophus*.

Name.	Catalogue No.	Locality.	Sex.	Head and body.	Tail.	Forearm.	Tibia.	Foot.	Ear from crown.	Condylar-basal length.	Maxillary tooth-row, including canine (alveoli).
				mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
<i>Rhinolophus trifolatus</i> .	153960	Kendawangan River.	Male....	54	34	49	24.0	12.0	21	20.5	8.3
Do.....	153961	.....do.....	Female..	53	32	51	26.0	13.0	22	.....	8.4
Do.....	153962	.....do.....	.....do....	55	34	52	27.0	14.0	23	21.4	8.3
Do.....	152090	Sampanahan River.	.....do....	57	31	53	28.0	14.5	22	21.7	8.8
<i>Rhinolophus affinis</i> .	152045	Pangkallahan River.	Male....	50	20	47	22.0	11.0	15	19.0	8.0
Do.....	152047	.....do.....	Female..	50	20	49	23.0	11.5	17	19.5	8.4
Do.....	154402	Upper Pasir River.	Male....	47	21	48	22.0	11.0	17	19.7	8.5
Do.....	154404	.....do.....	.....do....	47	22	49	23.0	12.5	17	19.7	8.3
Do.....	154406	.....do.....	Female..	47	20	49	23.0	12.0	18	20.4	8.3
<i>Rhinolophus borneensis</i> .	145611	Pulo Panebangan.	Male....	44	22	42	18.5	9.5	15	17.0	7.2
Do.....	145612	.....do.....	Female..	44	21	43	19.0	8.6	15	16.9	7.2
Do.....	145699	.....do.....	.....do....	43	21	43	18.3	9.0	16	17.0	7.1

## EMBALLONURA MONTICOLA Temminck.

1838. *Emballonura monticola* TEMMINCK, Tijdschr. Natuur. Gesch. Physiol. Leiden, vol. 5, p. 25. Type-locality, Java.

Seven specimens from the Matan River, ten from the Saratok River, Klumpang Bay.

(For measurements see table, p. 133.)

Brought by a Malay boy who said he got them under an overhanging rock. \* \* \*  
Brought by a Malay boy who said he got them in a cave. W. L. A.

## EMBALLONURA ANAMBENSIS Miller.

1900. *Emballonura anambensis* MILLER, Proc. Wash. Acad. Sci., vol. 2, p. 236, August 20, 1900. Type-locality, Anamba Islands.

1906. *Emballonura anambensis* MILLER, Proc. U. S. Nat. Mus., vol. 31, p. 63, July 23, 1906.

In addition to the twenty-six bats of this species collected on Karinata Island in 1904 Doctor Abbott secured nineteen others in 1908. Five specimens from Pulo Panebangan may be referred to the same species.

(For measurements of the Panebangan specimens, see table, p. 133.)

## EMBALLONURA PUSILLA, new species.

*Type*.—Adult female, preserved in alcohol, and skull removed, Cat. No. 153940, collected at Mankol, Kendawangan River, southwestern Borneo, September 29, 1908, by Dr. W. L. Abbott. Original number, 6223.

*Diagnostic characters*.—Like the Bornean form of *Emballonura monticola*, but with a distinctly smaller skull.



*Color*.—Type: Dried out of alcohol temporarily, hair of upper parts between seal and mummy brown, becoming much lighter at base, like a pale sepia; under parts similar to a rather dark Broccoli brown, with the hairs of the throat and chin inclining toward russet; ears, membranes, etc., blackish.

*Skull and teeth*.—Essentially like those of the Bornean *Emballonura monticola*, but distinctly smaller and weaker; space between the canine and the large premolar distinctly less in the smaller bat.

*Measurements*.—Type: Head and body, 36 mm.; tail, 9; forearm, 44; thumb, 6; first finger, 35; second finger, 60; third finger, 44; fourth finger, 43; tibia, 17; foot, 8; ear from crown, 9; greatest length of skull, 13.3; zygomatic width, 8.3; greatest width of brain case, 6.5; interorbital constriction, 2.8; greatest superior width of rostrum, 5.3; maxillary tooththrow, including canine, 5.; mandibular tooththrow, including canine, 5.2. Also see table below.

*Specimens examined*.—Four, two from the Kendawangan River and two from the Pangkallahan River.

Hanging beneath a rock in the forest.—W. L. A.

*Measurements of Emballonura.*

Name.	Catalogue No.	Locality.	Sex.	Head and body.		Tail.	Forearm.	Tibia.	Foot.	Ear from crown.	Condylar-basal length.	Maxillary tooththrow, including canine.
<i>Emballonura monticola</i> .	145658	Matan River.....	Female	mm. 43	mm. 11	mm. 48	mm. 18	mm. 8.5	mm. 11	mm. 13.8	mm. 5.9	
Do.....	145659	.....do.....	do.....	46	11	48	19	8.6	12	14.4	6.1	
Do.....	145660	.....do.....	do.....	43	13	47	17	8.0	10	14.0	5.8	
Do.....	145664	.....do.....	Male	43	13	48	19	8.2	11	14.3	6.0	
Do.....	152099	Saratok River.....	Female	47	11	47	19	8.4	11	14.2	6.0	
Do.....	152100	.....do.....	do.....	42	12	46	19	7.6	12	13.8	5.7	
Do.....	152102	.....do.....	do.....	44	13	47	18	8.2	10	14.3	6.0	
<i>Emballonura anambensis</i> .	145665	Pulo Panebangan.....	do.....	42	11	.....	17	8.0	11	13.7	5.6	
Do.....	145666	.....do.....	do.....	43	11	47	18	8.6	11	13.4	5.7	
Do.....	145669	.....do.....	do.....	44	13	45	17	8.4	11	13.5	5.7	
<i>Emballonura pusilla</i>	153939	Kendawangan River.....	do.....	41	12	45	17	8.0	10	12.5	5.2	
Do.....	153940 <sup>1</sup>	.....do.....	do.....	36	9	44	17	8.0	9	12.4	5.0	
Do.....	152091	Pangkallahan River.....	do.....	40	13	42	17	8.5	9	12.5	5.0	

<sup>1</sup> Type.

MYOTIS CARIMATÆ Miller.

1906. *Myotis carimatæ* MILLER, Proc. U. S. Nat. Mus., vol. 31, p. 62, July 23, 1906.

Two specimens collected on Karimata in 1904 and three from the Kendawangan River in 1908. The mainland specimens do not appear to be different from the island form.

(For measurements see table, p. 136.)

## MYOTIS MURICOLA (Gray).

1841. *Vespertilio muricola* HODGSON, Journ. Asiatic Soc. Bengal, vol. 10, p. 908 (*Nomen nudum*).  
1846. *Vespertilio muricola* GRAY, Cat. Spec. Draw. Mamm. Birds Nepal and Thibet, presented by B. H. Hodgson to British Museum, p. 4.  
1907. *Myotis muricola*, LYON, Proc. U. S. Nat. Mus., vol. 33, p. 563, December 24, 1907.

Thirty-seven specimens from Mankol, Kendawangan River, nine from the Sempang River, and forty-one from Pulo Laut, all preserved in alcohol.

(For measurements see table, p. 136.)

Caught roosting in plantain leaves.

Roosting in curled-up young banana leaves.

Roosting in the folds of the mainsail, out near the end of the main boom.—W. L. A.

## GLISCHROPUS TYLOPUS (Dobson).

1875. *Vesperugo (Glischropus) tylopus* DOBSON, Proc. Zool. Soc. London, p. 473.  
1907. *Glischropus tylopus*, LYON, Proc. U. S. Nat. Mus., vol. 33, p. 563, December 24, 1907.

Fifty-six specimens from the Kapuas River region, collected in 1905.

## KERIVOULA HARDWICKII (Horsfield).

1825. *Vespertilio hardwickii* HORSFIELD, Zool. Researches in Java.  
1907. *Kerivoula hardwickii*, LYON, Proc. U. S. Nat. Mus., vol. 33, p. 563, December 24, 1907.

One specimen from the Kapuas River in 1905.

## KERIVOULA BOMBIFRONS, new species.

*Type*.—Preserved in alcohol, skull removed, adult male, Cat. No. 145616, U.S.N.M., collected along the Matan River, western Borneo, August 15, 1907, by Dr. W. L. Abbott. Original number 5497.

*Diagnostic characters*.—A small member of the genus, light in color, with large ears, apparently rather closely related to *Kerivoula pellucida* Waterhouse from the Philippines, but middle incisors not unusually slender, and membranes and legs more hairy.

*Color*.—Type; temporarily dried from alcohol: Upper parts, a light wood brown with a slight tint of cinnamon; under parts, a light ecru drab, but rather dull; wing membranes, brownish something between Prout's and hair brown; bases of hairs lighter in color than tips; uropatagium similar in color to fur of upper parts.

*Membranes, etc*.—Uropatagium moderately well furred, hairs at free edge not longer or more numerous than elsewhere; legs and dorsum of foot quite well furred; forearm, and carpus and bases of fingers with rather scant, short hairs; edge (width of 4 mm.) of membrane from foot to fifth digit, hairy to about same extent as uropatagium, membrane between elbow and foot moderately haired.

*Ears*.—Large, extending about 3 mm. beyond end of muzzle when laid forward; inner margin uniformly convex; outer margin with a very obtuse angle about opposite tip of tragus; tragus, long (8.5 mm.) slender (1.7 mm. wide at base), tapering gradually to a point, at lower outer angle, a small obtuse lobe, projecting about 0.5 mm.

*Skull*.—Brain-case rather narrowed from side to side but considerably enlarged and swollen from above downward, anteriorly; interorbital region narrow (3 mm.); a small concave depression at base of rostrum, in front of interorbital constriction; as the skull rests on its natural base the facial portion is much tilted upward; or with the skull resting on the maxillary toothrow, the cranial portion is much tilted upward; in comparison with *K. hardwickii* and *K. picta*, the portion of the palate posterior to the toothrow is very narrow (about 1.5 mm. as to 2.0 mm.)

*Teeth*.—Very similar to those in the Kapuas River specimen of *Kerivoula hardwickii*, except that  $m^1$  is more compressed antero-posteriorly,  $pm^3$  has a slightly greater crown surface and less vertical depth as compared with the other upper premolars; the lower premolars in *K. bombifrons* are relatively slightly larger and with greater antero-posterior diameter than they are in *K. hardwickii*, especially the middle premolars.

*Measurements*.—Head and body, 39 mm.; tail, 40; forearm, 30; second digit, 30; third finger, 60; fourth finger, 47; fifth finger, 41; tibia, 14; foot, 9; ear from crown, 12; ear, tip to tip (without stretching), 25; greatest breadth of ear, 11; condylo-basal length of skull, 13; maxillary tooth-row, including canine, 5.6; mandibular tooth-row, front of canine to back of last molar, 6.2; zygomatic width, 7.8; width of brain-case, 6.8.

*Specimens examined*.—One, the type.

*Remarks*.—The only other species of *Kerivoula* hitherto recorded from Borneo are *hardwickii*,<sup>1</sup> *pusilla*,<sup>2</sup> and *papillosa*.<sup>3</sup> From *K. hardwickii*, *K. bombifrons* differs conspicuously in its narrower skull, anteriorly inflated brain-case, narrower interorbital constriction, and by its lighter color; from *K. pusilla*, by its generally larger size and distinctly larger ears; and from *K. papillosa* by its much smaller size, relatively larger ears, and relatively larger incisors.

Shot while hanging from a leaf in dense forest.—W. L. A.

<sup>1</sup> See page 134.

<sup>2</sup> Thomas, Ann. Mag. Nat. Hist., ser. 6, vol. 14, p. 461, December, 1894.

<sup>3</sup> Hose, Mammals of Borneo, p. 40, 1893.

## Measurements of bats.

Name.	Catalogue No.	Locality.	Sex.	Head and body.	Tail.	Forearm.	Tibia.	Foot.	Ear from crown.	Condylar-basal length of skull.	Maxillary toothrow, including canine.
				mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
<i>Nycteris javanica</i> .	154386	Upper Pasir River.	Female	63	58	47.0	27.0	11.0	25	19.0	7.8
<i>Megaderma spasma trifolium</i> .	153877	Batu Jurong.....	Male	70	0	61.0	35.0	19.0	28	19.7	9.2
Do.	153878	do.	do.	65	0	57.0	34.0	17.0	26	20.5	10.0
Do.	153880	do.	do.	63	0	56.0	35.0	17.0	29	20.8	9.4
Do.	153881	do.	Female	71	0	60.0	35.0	18.0	28	.....	.....
Do.	153866	Pulo Bauwal, small islet northeast of.	Male	77	0	55.0	30.0	17.0	.....	20.5	9.0
Do.	153869	do.	Female	61	0	56.0	31.0	17.0	28	19.5	8.9
Do.	153870	do.	do.	70	0	58.0	35.0	16.0	31	20.5	9.5
Do.	153872	do.	Male	64	0	56.0	34.0	17.0	30	20.0	9.4
Do.	145576	Pulo Lamukotan...	Female	.....	0	60.0	35.0	18.0	.....	20.5	8.9
Do.	145653	do.	do.	60	0	59.0	34.0	18.0	30	20.2	9.1
Do.	145654	do.	Male	63	0	59.0	34.0	19.0	31	20.3	9.3
Do.	145657	do.	Female	65	0	60.0	33.0	18.0	31	20.0	9.3
<i>Kerivoula bombifrons</i>	145616	Matan River.....	Male	39	40	30.0	14.0	9.0	12	13.0	5.6
<i>Myotis carimata</i> .	153936	Kendawangan River.	do.	44	35	38.0	18.0	11.0	11	14.0	5.7
Do.	153937	do.	do.	47	36	38.0	18.0	11.0	12	14.8	5.7
Do.	153938	do.	Female	45	33	38.5	18.0	11.0	11	14.5	5.9
<i>Myotis muricola</i> .	145617	Sempang River.	Male	39	34	33.4	14.5	7.2	10	13.2	5.1
Do.	145619	do.	Female	38	30	32.4	14.5	7.2	10	12.5	5.1
Do.	145623	do.	Male	37	30	33.0	14.0	7.6	10	12.9	5.3
Do.	153899	Kendawangan River.	Female	40	35	33.5	14.5	7.2	11	13.0	5.5
Do.	153902	do.	Male	37	32	32.9	15.0	7.0	10	13.0	5.0
Do.	153903	do.	Female	40	36	32.8	14.8	7.5	11	13.0	5.2
Do.	153904	do.	do.	38	35	33.6	15.6	7.5	11	13.1	5.3
Do.	153934	do.	do.	37	36	35.0	15.9	7.3	11	12.8	5.4
Do.	152010	Pulo Laut.	Male	38	36	33.0	15.5	7.8	11	12.9	5.4
Do.	152019	do.	do.	39	32	34.0	16.0	7.0	10	13.0	5.1
Do.	152032	do.	do.	39	32	34.0	15.6	7.3	12	12.7	5.4
Do.	152004	do.	Female	38	37	35.0	16.4	7.8	11	13.1	5.3
Do.	152027	do.	do.	38	35	34.0	15.5	7.6	11	13.3	5.4
Do.	152034	do.	do.	37	37	35.0	16.0	7.4	10	12.5	5.2

1 Type.

## TARSIVS BORNEANUS Elliot.

1907. *Tarsius tarsier*, LYON, Proc. U. S. Nat. Mus., vol. 33, p. 565, December 24, 1907.1910. *Tarsius borneanus* ELLIOT, Bull. Amer. Mus. Nat. Hist., vol. 28, p. 153, May 27, 1910.

Four specimens collected by Doctor Abbott in western Borneo in 1905.

## NYCTICEBUS BORNEANUS Lyon.

1906. *Nycticebus borneanus* LYON, Proc. U. S. Nat. Mus., vol. 31, p. 535, November 9, 1906.1907. *Nycticebus borneanus*, LYON, Proc. U. S. Nat. Mus., vol. 33, p. 565, December 24, 1907.

Nine specimens from western Borneo, collected by Doctor Abbott in 1905.

## PITHECUS NEMESTRINUS (Linnaeus).

1766. [*Simia*] *nemestrina* LINNÆUS, Syst. Nat., vol. 1, 12th ed., p. 35. Type-locality, Sumatra.1907. *Macaca nemestrina*, LYON, Proc. U. S. Nat. Mus., vol. 33, p. 565, December 24, 1907. (Landak and Sakaïam rivers specimens.)

Three specimens, a skin and skull from Sukadana, an odd weathered skull from the Kendawangan River, and a skin and skull from Pamukang Bay. The two skins have hairs that are distinctly annulated, and the skulls are of the narrow type, quite unlike the skin and skull of the type of *P. broca* Miller<sup>1</sup> from northern Borneo.

(For measurements see table, p. 138.)

PITHECUS MANDIBULARIS Elliot.

1907. *Macaca fascicularis*, LYON, Proc. U. S. Nat. Mus., vol. 33, p. 565, December 24, 1907.

1910. *Pithecus mandibularis* ELLIOT, Proc. U. S. Nat. Mus., vol. 38, p. 347, August 6, 1910.

Only one specimen of the usually common Malay long-tailed macaque was obtained by Doctor Abbott in Borneo, on the Sungei Sama, near Pontianak, in 1905.

(For measurements see table, p. 138.)

PITHECUS CARIMATÆ Elliot.

1906. *Macaca fascicularis* MILLER, Proc. U. S. Nat. Mus., vol. 31, p. 65, July 23, 1906.

1910. *Pithecus carimatæ* ELLIOT, Proc. U. S. Nat. Mus., vol. 38, p. 346, August 6, 1910.

Two skins and skulls from Telok Pai, Karimata Island, collected by Doctor Abbott in 1904.

(For measurements see table, p. 138.)

PITHECUS CUPIDUS Elliot.

1910. *Pithecus cupidus* ELLIOT, Proc. U. S. Nat. Mus., vol. 38, p. 348, August 6, 1910.

Skin and skull and an odd weathered skull from Pulo Mata Siri.

(For measurements see table, p. 138.)

PITHECUS BAWEANUS Elliot.

1910. *Pithecus baweanus* ELLIOT, Proc. U. S. Nat. Mus., vol. 38, p. 347, August 6, 1910.

Two skins and skulls from Bawean Island.

(For measurements see table, p. 138.)

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<sup>1</sup> Proc. U. S. Nat. Mus., vol. 29, p. 558, Feb. 3, 1906.



Measurements of *Pithecus*.

Name.	Locality.	Catalogue No.	Sex.	Age.	Head and body. <sup>1</sup>	Tail. <sup>1</sup>	Hind foot. <sup>1</sup>	Weight. <sup>2</sup>	Basal length of skull.	Zygomatic width.	Front of c <sup>1</sup> to back of m <sup>3</sup> .
<i>P. nemestrinus</i> .	Sukadana.....	145330	Male....	Adult.....	mm. 615	mm. 220	mm. 190	kilos. 10.9	mm. ....	mm. ....	mm. ....
Do.....	Ken dawangan River.	153804	...do....	...do....	( <sup>1</sup> ) .....	.....	.....	.....	.....	.....	47.0
Do.....	Pamukang Bay.	154367	...do....	...do....	590	240	195	10.9	115	101	48.0
<i>P. mandibularis</i> .	Near Pontianak, Sungai Sama.	<sup>3</sup> 142225	...do....	...do....	445	570	140	5.0	.....	77	37.0
<i>P. cupidus</i> ..	Pulo Mata Siri.	<sup>3</sup> 151831	...do....	...do....	435	540	127	4.8	85	81	36.4
Do.....	do.....	154368	...do....	...do....	( <sup>1</sup> ) .....	.....	.....	.....	87	83	38.0
<i>P. baweanus</i>	Bawean Island.	<sup>3</sup> 151829	...do....	...do....	472	580	141	6.2	91	89	42.5
Do.....	do.....	151830	Female..	...do....	438	535	122	3.9	74	74	34.5
<i>P. carimatæ</i> .	Karimata Island	<sup>3</sup> 125101	Male....	...do....	460	655	144	5.4	81	78	37.4
Do.....	do.....	125102	...do....	...do....	460	630	145	5.2	.....	.....	.....

## PYGATHRIX RUBICUNDA RUBICUNDA (Müller).

1838-39. *Semnopithecus rubicundus* MÜLLER, Tijdschr. Natuur. Gesch. Physiol., vol. 5, p. 137.

1839-1844. *Semnopithecus rubicundus*, MÜLLER and SCHLEGEL, Verh. Nat. Gesch. Nederl. Bezitt, pp. 61 and 69, pl. 9, figs. 1, 2, 3, and 4; pl. 11, fig. 1. Type-locality, southeastern Borneo.

Doctor Abbott secured three specimens of *Pygathrix rubicunda rubicunda* from Balik Papan Bay and three from the Seratok River. These six specimens are practically topotypes of the species, the original specimens having been collected at Mount Sakumbang and Tana Lawut. (The latter place does not appear on any of the available maps. Mount Sakumbang is shown on the map on page 57.) They are of a generally darker red color than any of the other Bornean specimens of this species in the National Museum, and the hands and feet have a more distinct tendency to be suffused with blackish.

There seem to be three distinct forms of this species on Borneo, *P. rubicunda rubicunda* from southeastern Borneo, *P. rubicunda ignita*<sup>5</sup> from the northern parts of the island, a new form described below as *P. rubicunda rubida* from western Borneo, south of the Kapuas River. A fourth subspecies, *P. rubicunda carimatæ*, from Karimata Island is evidently derived from the Bornean fauna.

The differential characters of the four forms are set fourth in the table below.

(For measurements, see table, p. 141.)

<sup>1</sup> Collector's measurements.

<sup>2</sup> Collector's measurements computed to kilograms.

<sup>3</sup> Type.

<sup>4</sup> Weathered skull.

<sup>5</sup> Dollman, Ann. Mag. Nat. Hist., ser. 8, vol. 4, p. 204, September, 1909.

PYGATHRIX RUBICUNDA RUBIDA, new subspecies.

*Type*.—Skin and skull of adult female, Cat. No. 153790, U.S.N.M., collected at Batu Jurong, southwestern Borneo, June 17, 1908, by Dr. W. L. Abbott. Original number, 5979.

*Diagnostic characters*.—Closely related to *Pygathrix rubicunda rubicunda*, differing in having a somewhat lighter color, no conspicuous suffusion of blackish color on the hands and feet, less prominent outer edge of the mastoid, and a distinct space between that edge and the edge of the posterior root of the zygoma.

*Color*.—Type: General color similar to Ridgway's hazel, but rather brighter, the hairs generally darker at the ends and lighter at bases, so that on the back where the hairs are longest, the general color is dark hazel; a considerable number of blackish hairs on the dorsal surface of the fingers and toes.

*Skull and teeth*.—The skull and teeth of *Pygathrix rubicunda rubida* are in general as they are in *P. r. rubicunda*; the outer edge of the mastoid, however, is more inconspicuous than it is in the typical form and is usually separated from the outer edge of the posterior root of the zygoma by a more or less well-defined groove or distinct space.

*Measurements*.—See table, page 141.

*Specimens examined*.—Twelve, from various localities in southwestern Borneo. (See table of measurements for exact localities.)

PYGATHRIX RUBICUNDA CARIMATÆ Miller.

1906. *Presbytis carimatæ* MILLER, Proc. U.S. Nat. Mus., vol. 31, p. 65, July 23, 1906.

In addition to the original series of seven specimens collected in 1904, two additional specimens were collected on Karimata Island at Telok Edar by Dr. W. L. Abbott in 1908.

(For external and cranial measurements see table, p. 141.)

*Diagnostic characters of the forms of Pygathrix rubicunda.*

<i>P. rubicunda carimatæ.</i>	<i>P. rubicunda rubida.</i>	<i>P. rubicunda rubicunda.</i>	<i>P. rubicunda ignita.</i>
Lighter colored, without well-marked blackish suffusion on hands and feet.	Lighter colored, without well-marked blackish suffusion on hands and feet.	Darker colored, with blackish suffusion on hands and feet.	Lighter colored, without blackish suffusion on hands and feet.
Post-glenoid process long and heavy.	Post-glenoid process not conspicuously developed.	Post-glenoid process not conspicuously developed.	Post-glenoid process not conspicuously developed.
Fossa between pterygoids relatively shallow.	Fossa between pterygoids relatively shallow.	Fossa between pterygoids intermediate in character.	Fossa between pterygoids relatively deep.
Outer edge of mastoid relatively less conspicuous.	Outer edge of mastoid relatively less conspicuous.	Outer edge of mastoid rather conspicuous.	Less conspicuous.
Outer edge of posterior zygomatic root as a rule not separated from outer mastoid edge by a distinct space or groove, but the two edges soon confluent.	Outer edge of posterior zygomatic root separated from outer mastoid edge by a more or less well-defined groove or distinct space.	Outer edge of posterior zygomatic root as a rule not separated from outer mastoid edge by a distinct space or groove, but the two edges soon confluent.	Outer edge of posterior zygomatic root as a rule not separated from outer mastoid edge by a distinct space or groove, but the two edges soon confluent.
Angle of jaw and condyle large and heavy.	Angle of jaw and condyle not so large and heavy.	Angle of jaw and condyle not so large and heavy.	Angle of jaw and condyle not so large and heavy.

**PYGATHRIX FRONTATA (Müller).**

1838-39. *Semnopithecus frontatus* MÜLLER, Tijdschr. Natuur. Gesch. Physiol., vol. 5, p. 136.

1839-44. *Semnopithecus frontatus* MÜLLER and SCHLEGEL, Verh. Nat. Gesh. Nederl. Bezitt., pp. 62 and 78, pl. 8, figs. 1-4.

Ten specimens of this rare monkey were collected by Doctor Abbott in southeastern Borneo, eight at Klumpang Bay, and two at Balikpapan Bay.

(For measurements see table, p. 141.)

Generally common.—W. L. A.

**PYGATHRIX CRISTATA (Raffles).**

1822. *Simia cristata* RAFFLES, Trans. Linn. Soc. London, vol. 13, p. 244. Type-locality, Sumatra.

1907. *Presbytis cristata*, LYON, Proc. U. S. Nat. Mus., vol. 33, p. 568, December 27, 1907. Kapuas River specimens.

In addition to two specimens of *Presbytis cristata* taken by Doctor Abbott in the Kapuas River region, an adult female and her young were taken at the Pasir River, southeastern Borneo.

(For measurements of the specimens see table, p. 141.)

In point of coloration the young specimen bears no resemblance whatever to its parent. The hairs are everywhere ochraceous in color, with the exception of a fringe of long blackish hairs over the forehead. A good illustration of the young may be seen in Verhandelungen over de Natuurlijke Geschiedenis der Nederlandsche overzeesche Bezittingen, plate 12, fig. 1.

**PYGATHRIX CHRYSOMELAS (Müller).**

1838-39. *Semnopithecus chrysomelas* MÜLLER, Tijdschr. Natuurl. Gesch. Physiol. vol. 5, p. 138. Type-locality, Pontianak, western Borneo.

1907. *Presbytis chrysomelas*, LYON, Proc. U. S. Nat. Mus., vol. 33, p. 567, December 27, 1907.

Nine specimens from Pontianak, and the lower Landak and Kapuas rivers. None were collected by Doctor Abbott in southwestern or southeastern Borneo.

Measurements of *Pygathrix*.

Name.	Locality.	Catalogue No.	Sex.	Age.	Head and body. <sup>1</sup>	Tail. <sup>1</sup>	Hind foot. <sup>1</sup>	Weight. <sup>2</sup>	Basal length of skull.	Front of canine to back of m <sup>3</sup>	Zygomatic width.
					mm.	mm.	mm.	kgs.	mm.	mm.	mm.
<i>P. frontata</i> ...	Klumpang Bay.	151819	Male....	Not quite adult.	405	660	158	3.6	56.7	26.9	66.6
Do.....	do.....	151820	Female.....	.....	480	710	170	5.7	.....	.....	.....
Do.....	do.....	151821	do.....	.....	405	695	172	4.0	.....	.....	.....
Do.....	do.....	151822	do.....	Old.....	505	735	178	6.5	64.8	29.5	75.0
Do.....	do.....	151823	do.....	do.....	500	660	175	5.9	61.6	28.0	69.8
Do.....	do.....	151824	do.....	.....	495	700	170	5.4	.....	.....	.....
Do.....	do.....	154363	do.....	Adult.....	480	710	173	6.4	63.3	28.7	72.3
Do.....	Sampanahan River.	151825	Male.....	do.....	480	640	168	5.6	64.7	29.3	73.3
Do.....	Balik Papan Bay.	154361	Female.....	Young adult	445	745	175	5.0	62.3	28.9	67.0
Do.....	do.....	154362	do.....	.....	490	710	163	6.4	62.5	29.8	68.5
<i>P. cristata</i> ...	Pasir River.....	154359	do.....	Adult.....	515	635	140	5.2	59.3	28.0	68.5
Do.....	do.....	154360	Male.....	Very young.	200	280	70	.....	.....	.....	.....
<i>P. rubicunda rubida</i> .	Sukadana.....	145331	do.....	Not quite adult.	475	665	165	4.4	56.0	26.0	63.4
Do.....	do.....	145332	Female.....	Old.....	525	750	175	6.0	61.2	28.3	67.5
Do.....	do.....	145333	do.....	.....	510	690	165	6.9	.....	.....	.....
Do.....	do.....	145334	Male.....	Adult.....	540	695	177	7.4	65.2	28.9	72.3
Do.....	Semandang River.	145335	do.....	do.....	500	700	170	6.4	59.4	27.0	70.2
Do.....	Sempang River.	145336	do.....	do.....	500	705	188	6.9	63.7	28.5	69.6
Do.....	Batu Jurong.....	153789	do.....	do.....	530	710	182	6.7	60.6	27.3	70.7
Do.....	do.....	153790	Female.....	do.....	495	690	170	7.8	59.2	28.2	68.7
Do.....	do.....	153791	do.....	do.....	500	670	165	7.3	59.4	26.4	67.9
Do.....	do.....	153792	Male.....	do.....	505	675	178	6.7	61.4	27.6	72.2
Do.....	Kendawan River.	153793	Female.....	do.....	480	690	175	5.2	57.8	27.4	67.0
Do.....	do.....	153803	Male.....	do.....	.....	.....	.....	.....	59.6	25.7	68.9
<i>P. rubicunda rubicunda</i> .	Balik Papan Bay.	154364	do.....	do.....	485	660	175	6.4	61.9	28.9	69.6
Do.....	do.....	154365	do.....	.....	500	690	171	6.4	60.0	27.3	69.2
Do.....	do.....	154366	do.....	do.....	510	670	179	6.9	60.3	27.4	70.9
Do.....	Saratok River.....	151826	do.....	do.....	520	695	180	.....	62.2	26.6	71.6
Do.....	do.....	151827	do.....	do.....	507	710	173	.....	.....	.....	.....
Do.....	do.....	151828	Female.....	do.....	470	710	170	4.6	.....	.....	.....
<i>P. rubicunda carinata</i> .	Karimata Island.	153794	Male.....	do.....	505	700	175	6.9	64.4	29.5	71.5
Do.....	do.....	153795	Female.....	do.....	510	710	172	7.7	63.9	29.6	72.0

<sup>1</sup> Collector's measurements.<sup>2</sup> Collector's measurements in pounds and quarters computed in kilograms.<sup>3</sup> Type.

## NASALIS LARVATUS (Wurmb).

1907. *Nasalis larvatus*, LYON, Proc. U. S. Nat. Mus., vol. 33, p. 569, December 24, 1907.

Ten specimens from the Kapuas River region, four from southwestern and five from southeastern Borneo.

(For exact localities and measurements see table, p. 142.)

In southeastern Borneo *Nasalis larvatus* was common in the swampy lowlands at the edges (scarcely banks) of rivers and creeks. They understand the art of "sitting tight." I have often gone within a few feet of them in the Nipa Palms without noticing them.—W. L. A.

## Measurements of proboscis monkeys.

Locality	Catalogue No.	Sex.	Age.	Head and body. <sup>1</sup>	Hind foot. <sup>1</sup>	Tail. <sup>1</sup>	Weight. <sup>2</sup>	Basal length of skull.	Zygomatic width.	Front of canine to back of m. <sup>3</sup>
Sempang River.....	145323	Male....	Young adult..	mm. 710	mm. 230	mm. 670	kgs. 22.0	mm. 93.7	mm. 91.8	mm. 40.6
Do.....	145324	do.....	Adult.....	715	230	665	19.0	93.8	93.9	39.3
Do.....	145325	Female <sup>3</sup>	Old.....	560	182	550	9.5	72.9	73.3	33.9
Kendawangen River.....	153802	Male....	Young adult..					94.5	91.7	44.0
Pangkajene River.....	151816	Female..	Adult.....	600	180	520		71.3	72.3	31.7
Do.....	151817	do.....	do.....	565	188	605	8.6	60.9	72.3	33.6
Pamukang Bay.....	151818	Male....	do.....	680	215	660		95.9	90.4	39.7
Balik Papan Bay.....	154374	do.....	Young adult..	690	228		19.0	93.9	93.9	41.8
Do.....	154375	Female..	do.....	560	181	590	9.0	71.0	73.5	36.2

<sup>1</sup> Collector's measurements.<sup>2</sup> Collector's measurements in pounds changed to kilograms.<sup>3</sup> Fetus in uterus.

## HYLOBATES LEUCISCUS (Schreber).

1907. *Hylobates leuciscus*, LYON, Proc. U. S. Nat. Mus., vol. 33, p. 570, December 24, 1907.

Seven specimens from the Landak and Kapuas rivers, collected in 1905.

## HYLOBATES MÜLLERI Martin.

1841. *Hylobates mülleri* MARTIN, Nat. Hist. Mamm. Anim., p. 444. Type-locality, "meridional parts of [Borneo]."

Twenty-three specimens of *Hylobates mülleri* were collected by Doctor Abbott in southwestern and southeastern Borneo. They are strikingly different in coloration from *Hylobates leuciscus* of the Kapuas River region. All of them have the crowns of the head and the hands and feet distinctly darker in color than the rest of the animal. I have been unable to find any tangible differences between the skulls of the two species, although they show many and marked individual variations. These gibbons from southern Borneo are separable into two geographic races, *H. mülleri mülleri*, from southeastern Borneo, and a new form described below. The type-locality of Martin's *H. mülleri* is simply southern Borneo. As the gibbons collected by Doctor Abbott in southeastern Borneo agree with Martin's description, especially as to the light-colored superciliary stripe not being continued down on to the face as light whiskers. The type-locality of *H. mülleri* may be restricted to southeastern Borneo.

Generally common.—W. L. A.

## HYLOBATES MÜLLERI ALBIBARBIS, new subspecies.

Type.—Skin and skull of adult male, Cat. No. 145327, U.S.N.M collected along the Matan River, a tributary to the Sempang, August 16, 1907, by Dr. W. L. Abbott. Original number, 5501.



*Diagnostic characters.*—A geographic race of *Hylobates mülleri* distinguished from the typical form by lighter crown patch, light-colored chin and side whiskers, and the lower back very much lighter in color than rest of upper parts.

*Color.*—Type: Narrow rim of hairs encircling face blackish, followed by a narrow, dirty white forehead band, widening and the individual hairs lengthening to form well-marked side whiskers and a whitish patch on throat; crown patch dark-drab color; anterior portion of back and sides, including adjacent portions of arms, a sort of drab gray; posterior portion of back and sides, pale cream buff; underparts, a blackish brown, continuous with the seal-brown color of the inner side of the arms and legs; dorsal surfaces of hands and feet blackish or blackish brown; outside of forearms and legs a sort of light clay or light isabella color. The colors everywhere are subdued and there are no abrupt changes from one color to the next. The main distinguishing color character between the gibbons of southeastern and southwestern Borneo are shown in the table below.

Gibbons from southwestern Borneo, <i>Hylobates mülleri albibarbis</i> .	Gibbons from southeastern Borneo, <i>Hylobates mülleri mülleri</i> .
Crown patch dark brown. Lower half of back, generally light buffy in color, and arms inclining toward same color. Side and chin whiskers buffy in six out of nine specimens, brownish in the other three. Underparts, including inner side of legs and arms, blackish brown, less widely diffused.	Crown patch blackish. Lower half of back, generally wood brown in color, and arms inclining toward same color. Side and chin whiskers brownish, not conspicuously different in color from rest of animal. Underparts, including inner side of legs and arms, blackish, widely diffused.

*Skull and teeth.*—I have been unable to find any characters by which to distinguish the skulls or teeth of the gibbons of one part of Borneo from those of another part of the island.

*Measurements.*—For external and cranial measurements of the type and series see table, page 144.

*Specimens examined.*—Ten, from various localities in southwestern Borneo. (For exact localities see table of measurements, p. 144.)

*Remarks.*—The gibbons of Borneo, as shown by Doctor Abbott's specimens, are all closely related, as is indicated in part by the lack of distinguishing characters in the skulls. *Hylobates leuciscus*, while very different in coloration from *H. mülleri*, is evidently not distantly removed. It possesses a light-colored forehead band and shows a darkening of the fingers and toes, but none of the specimens show an indication of the dark crown patch. It is not improbable that somewhere in Borneo the two forms intergrade. Doctor Abbott failed to indicate from which side of the Kapuas River his specimens were taken, but they probably came from the north bank, so that the Kapuas serves as a barrier between the two forms, as it does in the case of the *prevostii* group of squirrels. Intergradation should be looked for in the interior of the island near the sources of the Kapuas.

## Measurements of gibbons.

Name.	Locality.	Catalogue No.	Sex.	Age.	Head and body. <sup>1</sup>	Hind foot. <sup>1</sup>	Weight. <sup>2</sup>	Basal length of skull.	Zygomatic width.	Front of canine to back of m <sup>3</sup> .
<i>H. m. albrbarbis</i> .	Matan River	145327	Male	Old	mm. 462	mm. 144	kilos. 5.8	mm. 75.3	mm. 71.5	mm. 32.3
Do.	do.	145329	do.	Nearly adult	460	150	5.4	72.3	64.0	32.6
Do.	do.	145328	Female	Adult	497	149	6.1	79.6	68.2	37.8
Do.	Sukadana	145326	do.	do.	465	148	5.9	68.8	66.3	31.4
Do.	Batu Jurong	153796	Male	do.	468	137	4.9	72.7	65.5	30.0
Do.	do.	153798	do.	Old	470	145	6.0	74.2	66.2	30.4
Do.	do.	153797	Female	Young adult	465	145	6.8	70.3	69.2	31.9
Do.	do.	153799	do.	Adult	480	147	6.5	72.3	66.9	31.6
Do.	Kendawan gan River.	153800	Male	do.	475	146	6.5	76.0	74.0	34.2
Do.	do.	153801	Female	Old	480	148	6.2	75.3	73.2	31.3
<i>H. m. mülleri</i> .	Klumpang Bay	151832	Male	Adult	470	138	5.0	70.9	68.0	31.5
Do.	do.	151834	do.	Old	510	158	6.8	80.7	71.9	33.8
Do.	do.	151835	do.	do.	460	138	5.0	72.3	64.6	32.2
Do.	do.	151833	Female	Adult	470	144	5.8	72.8	68.9	32.0
Do.	do.	151836	do.	do.	465	135	4.6	72.0	66.7	32.9
Do.	Pangkalla han River.	151837	Male	do.	485	143	5.2	75.0	70.5	35.0
Do.	do.	151838	Female	Young adult	470	140	5.9	70.8	66.9	31.2
Do.	do.	151839	do.	do.	388	130	3.3	63.0	68.7	29.0
Do.	Pasir River	154369	do.	do.	435	135	4.2	65.1	63.7	28.2
Do.	Balik Papan Bay	154370	Male	Adult	440	135	5.2	68.0	70.4	29.4
Do.	do.	154371	Female	do.	470	140	5.4	74.5	66.2	31.3
Do.	do.	154372	do.	Old	450	143	5.4	72.0	68.5	33.2
Do.	do.	154373	do.	do.	460	135	5.6	69.0	63.0	32.6

## PONGO PYGMÆUS PYGMÆUS (Linnaeus).

1763. *Simia pygmæus* LINNÆUS, Amoenitates Academicæ, vol. 6, p. 68.

1904. *Pongo pygmæus pygmæus*, ROTHSCILD, Proc. Zool. Soc. London, 1904, vol. 2, p. 438.

1906. *Pongo pygmæus pygmæus*, LYON, Proc. U. S. Nat. Mus., vol. 33, p. 571, December 24, 1907 (26 specimens from the Landak region).

Orangs are represented by forty-eight specimens from southwestern Borneo in Doctor Abbott's recent collections, sixteen as skins and skulls and the remainder as skulls obtained from the natives. (For a list of specimens with the exact localities see table, p. 145. Immature or imperfect specimens among the skulls obtained from natives are not included in the table). No orangs were obtained in southeastern Borneo, Doctor Abbott remarking, "There are no orang-utans. They do not occur south of the Mahakam (also Mehakam, Mehakkam, or Koetei, Kutei, Koti) River,<sup>5</sup> but are said to be common to the northward of it."

I have been unable to discover any differences between orangs from the Landak River region and those from southwestern Borneo. In fact, it is with great difficulty that I have been able to find any

<sup>1</sup> Collector's measurements.

<sup>2</sup> Collector's weight in pounds, computed to kilograms.

<sup>3</sup> Type.

<sup>4</sup> This specimen has a tooth posterior to m<sup>3</sup> on both right and left sides, and posterior to m<sub>3</sub> on left side. The supernumerary teeth are well developed and functional, each about half the size of the tooth in front.

<sup>5</sup> This river is not shown on the map, p. 57, but lies about as far north of Balik Papan Bay as the Pasir River is south.

tangible differences between the oranges of northern Sumatra<sup>1</sup> and those from western Borneo. This difficulty is no doubt due in part to the bulkiness of the specimens and the resulting inability to get a view of both series as a whole, as can so readily be done with small mammals in a tray. The Bornean oranges, however, appear to be slightly larger externally and cranially; to be lacking nails on the great toes almost entirely; to have a less conspicuous beard; and to possess less hair about the head and neck generally.

Illustrations of the head of a freshly killed male, and the entire body, and of the head of a freshly killed female are shown on plates 5, 6, and 7.

*Measurements of oranges.*

Sex and age.	Locality.	Catalogue No.	Crown of head to sole of foot. <sup>1</sup>	Head and body. <sup>2</sup>	Hind foot. <sup>2</sup>	Weight. <sup>3</sup>	Basilar length of skull.	Zygomatic width.	Mastoid width.	Upper toothrow, including canine (alveol.).	With nails on great toes.	Without nails on great toes.
			<i>mm.</i>	<i>mm.</i>	<i>mm.</i>	<i>kilos</i>	<i>mm.</i>	<i>mm.</i>	<i>mm.</i>	<i>mm.</i>		
Male, adult.....	Semandang River..	145301	1,410	957	355	200	168	173	147	70	....	+
Male, young, <i>m</i> <sup>3</sup> not visible.	Sempang River....	145303	1,055	680	267	66	124	126	122	<sup>4</sup> 53	....	+
Male, adult.....	do.....	145304	( <sup>5</sup> )	( <sup>5</sup> )	( <sup>5</sup> )	180	180	174	142	70	....	+
Male, adult, rather old	Matan River.....	145305	1,400	968	335	175	183	173	156	71	....	+
Male, young, <i>m</i> <sup>3</sup> not through alveolus.	do.....	145307	1,150	735	290	75	141	132	122	68	....	+
Male, adult.....	do.....	145310	.....	.....	.....	.....	181	175	154	70	....	+
Male, adult, rather old	Semandang River..	145313	.....	.....	.....	.....	.....	183	147	74	....	....
Male, adult.....	do.....	145314	.....	.....	.....	.....	.....	178	.....	71	....	....
Do.....	Sempang River....	145316	.....	.....	.....	.....	.....	179	161	75	....	....
Male, adult, rather old	do.....	145317	.....	.....	.....	.....	.....	182	176	145	77	....
Male, adult.....	do.....	145318	.....	.....	.....	.....	.....	178	172	76	....	....
Male, adult, rather young.	Kendawangan River.	153806	.....	.....	.....	.....	.....	165	155	141	74	....
Do.....	do.....	153807	.....	.....	.....	.....	.....	.....	165	148	77	....
Male, adult.....	do.....	153816	.....	.....	.....	.....	.....	174	168	<sup>6</sup> 66	....	....
Do.....	do.....	153823	1,300	970	335	<sup>7</sup> 200	168	167	154	70	....	+
Male, adult, rather young.	Mambulah River..	153827	.....	.....	.....	.....	.....	160	157	69	....	....
Female, adult.....	Sempang River....	145300	.....	745	285	72	129	128	118	56	....	+
Do.....	Semandang River..	145302	.....	850	290	100	144	139	124	60	....	+
Do.....	Matan River.....	145306	1,160	770	295	82	141	143	121	63	....	+
Do.....	Sempang River....	145308	1,200	805	310	<sup>8</sup> 72	151	141	124	65	....	+
Do.....	do.....	145309	.....	.....	.....	.....	.....	134	129	122	64	....
Do.....	Semandang River..	145315	.....	.....	.....	.....	.....	134	122	62	....	....
Do.....	Sempang River....	145320	.....	.....	.....	.....	.....	130	129	121	62	....
Do.....	do.....	145321	.....	.....	.....	.....	.....	133	129	61	....	....
Do.....	Batu Jurong.....	153805	1,160	785	262	<sup>7</sup> 88	129	127	116	62	....	+
Do.....	Kendawangan River.	153809	.....	.....	.....	.....	.....	133	.....	62	....	....
Do.....	do.....	153818	.....	.....	.....	.....	.....	130	139	123	63	....
Female, adult, rather old.	do.....	153820	.....	.....	.....	.....	.....	141	.....	65	....	....
Female, young, <i>m</i> <sup>3</sup> not through alveolus.	do.....	153821	.....	740	270	<sup>7</sup> 76	117	121	120	<sup>4</sup> 49	....	+
Female, adult.....	do.....	153822	1,065	755	250	<sup>8</sup> 60	125	123	112	59	....	+
Female, young, <i>m</i> <sup>3</sup> level with alveolus.	do.....	153824	1,200	770	280	81	126	123	122	64	....	+
Female, adult.....	Mambulah River..	153828	.....	.....	.....	.....	137	131	118	65	....	....

<sup>1</sup> Lyon Proc. U. S. Nat. Mus., vol. 34, p. 676, September 14, 1908.  
<sup>2</sup> Collector's measurements.  
<sup>3</sup> Collector's measurements in pounds and quarters computed to kilograms.  
<sup>4</sup> *m*<sup>3</sup> not included.  
<sup>5</sup> "In rigor mortis, impossible to measure."  
<sup>6</sup> "Teeth unusually small."  
<sup>7</sup> "Fat."  
<sup>8</sup> "Gutted."

## EXPLANATION OF PLATES.

## PLATE 1.

(About one-third natural size.)

- FIGS. 1 and 3. Skull of type of *Muntiacus rubidus*, Cat. No. 151863, U.S.N.M., Pamukang Bay, southeastern Borneo, p. 73.  
2 and 4. Skull of *Muntiacus pleiharicus*, Cat. No. 154384, U.S.N.M., Pamukang Bay, southeastern Borneo, p. 71.

## PLATE 2.

(About one-third natural size.)

- FIG. 1. Skull of *Muntiacus pleiharicus*, Cat. No. 154384, U.S.N.M., Pamukang Bay, southeastern Borneo, p. 71.  
2. Skull of type of *Muntiacus rubidus*, Cat. No. 151863, U.S.N.M., Pamukang Bay, southeastern Borneo, p. 73.

## PLATE 3.

(About one-fourth natural size.)

Antlers of Bornean muntjacs collected by Dr. W. L. Abbott in southwestern Borneo.

- FIG. 1. Cat. No. 153772, U.S.N.M., Kendawangan River.  
2. Cat. No. 153762, U.S.N.M., Kendawangan River.  
3. Cat. No. 153756, U.S.N.M., Kendawangan River.  
4. Cat. No. 153763, U.S.N.M., Kendawangan River.  
5. Cat. No. 145364, U.S.N.M., Sempang River.  
6. Cat. No. 153766, U.S.N.M., Kendawangan River.  
7. Cat. No. 153764, U.S.N.M., Kendawangan River.

## PLATE 4.

Squirrels of the *Sciurus prerostii* group collected by Dr. W. L. Abbott on the Bornean mainland (slightly more than one-fourth natural size; reproduced directly from the specimens), pp. 79 to 81.

- FIG. 1. *Sciurus borneoensis palustris*, adult male, Cat. No. 142331, U.S.N.M., Kapuas River, north bank near mouth, western Borneo, September 23, 1905.  
2. *Sciurus borneoensis borneoensis*, adult male, Cat. No. 142308, U.S.N.M., Kapuas River, north bank, at Sanggan, western Borneo, August 25, 1905.  
3. *Sciurus sanggaus*, adult female, Cat. No. 142328, U.S.N.M., Kapuas River, south bank, September 20, 1905.  
4. *Sciurus atricapillus*, adult female, Cat. No. 154292, U.S.N.M., Balik Papan Bay, southeastern Borneo, February 19, 1909.

## PLATE 5.

Head of a freshly killed adult male Bornean orang utan, photographed by Dr. W. L. Abbott, p. 144.

## PLATE 6.

Freshly killed adult male Bornean orang utan, photographed by Dr. W. L. Abbott, p. 144.

## PLATE 7.

Head of a freshly killed adult female Bornean orang utan, photographed by Dr. W. L. Abbott, p. 144.